FLIGHT
The AIRCRAFT ENGINEER AND AIRSHIPS

First Aeronautical Weekly in the World. Founded January, 1909

Founder and Editor: STANLEY SPOONER

A Journal devoted to the Interests, Practice and Progress of Aerial Locomotion and Transport

OFFICIAL ORGAN OF THE ROYAL AERO CLUB OF THE UNITED KINGDOM

No. 1140. (Vol. XXII. No. 44.) OCTOBER 31, 1930 [Weekly, Price 6d. Post free, 7½d. Abroad, 8d.

Editorial Offices: 36, GREAT QUEEN STREET, KINGSWAY, W.C.2.

Telephone: Editorial, Holborn 1884. Advertising, Holborn 3211
Telegrams: Truditur, Westcent. London.

Annual Subscription Rates, Post Free.

United Kingdom .. 33s. 0d. United States .. $8·75
Other Countries .. 35s. 0d.*

**Foreign subscriptions must be remitted in British currency.* (*See last Editorial Page.*)

CONTENTS

DIARY OF CURRENT AND FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in this list—

1930

Oct. 31 .. Bristol and Wessex Ae.C. Dance, Grand Spa Hotel, Bristol.
Nov. 7 .. Northamptonshire Ae.C. Annual Ball, Salon-de-Danse, Northampton.
Nov. 12 .. Cinque Ports F.C. Annual General Meeting.
Nov. 12 .. "Work of the Air Force in Aden," R.U.S.I. Lecture, by Sqdn.-Ldr. the Hon. R. A. Cochrane. 3 p.m.
Nov. 13 .. "Testing the Control of Aeroplanes," Lecture, by H. L. Stevens, before R.Ae.S
Nov. 13 .. "Triplex Glass Making," Lecture, before Westland Aircraft Soc.
Nov. 14 .. Central Flying School Reunion Dinner at Jules', Jermyn Street, London.
Nov. 20 .. "Recent Developments in Engine Cooling," Lecture, by Capt. H. Swan, before R.Ae.S.
Nov. 20 .. "Aircraft Detail Design—The Shops' Viewpoint," Lecture, by W. G. Gibson, before Westland Aircraft Soc.
Nov. 25 .. Norfolk and Norwich Ae.C. Annual Ball, Andrews Hall, Norwich.
Nov. 28 .. "Wapiti in India," Lecture, by Gr.-Capt. R. H. Verney, before Westland Aircraft Soc.
Dec. 4 .. "The Four-Foot Wind Tunnel," Lecture, by H. Glauert, before R.Ae.S.
Dec. 5 .. "Recent Long-Distance Flights," Lecture, by Capt. C. D. Barnard, before Westland Aircraft Soc.
Dec. 11 .. "Axial Engines." Lecture by M. L. Bramson, before R.Ae.Soc.
Dec. 11 .. "Float and Boat Seaplanes," Lecture, by Mr. Jackson, before Westland Aircraft Soc.
Nov. 28-Dec. 14 Paris Aero Show.

EDITORIAL COMMENT

THE Prime Minister has shown most laudable promptitude in appointing a Court to enquire into the loss of R 101. The type of Court appointed seems to be the best which could have been chosen for the purpose. Mr. MacDonald should also be congratulated on the personnel which he has secured. A mere inquiry, such as is held into an ordinary accident, while it serves its own purpose very well, would hardly have satisfied the public on this occasion.

The R 101 Court of Inquiry

It could, of course, conduct its proceedings openly, but it cannot compel the presence of witnesses or the production of evidence. There is, it is true, no probability that legal powers will be necessary to elicit all that can be elicited about this great tragedy, but it is a matter of some importance that no person and no paper should be able to suggest that more might have been brought to light if proper powers had existed. In this case, the Court will have full powers, and in this way it will command the fullest confidence of the public. It must be borne in mind that the Court consists of one man, namely, Sir John Simon. The Assessors are there to aid him by providing a certain amount of familiarity with air matters and with engineering questions. They may be able to ask pointed questions which would not occur to a layman, however eminent. It is open to the Assessors to sign the report of the Court or to draw up a report (presumably each might draw up a separate report) of their own.

Above all else, the Prime Minister and Lord Amulree are to be congratulated on the personality of the Court. Sir John Simon is, without any doubt, the very best man who could have been chosen for such an important task. His appointment resembles that of Lord Amulree, and was certainly inspired by similar motives. The Court must be impartial, and, for practical purposes, ignorant of the subject. It is on this principle that juries are chosen. But trial by jury is only suited to certain sorts of cases. In a jury trial, a lot of time and trouble must be expended by the judge and by counsel in explaining the

importance of the evidence to the very lay minds of the jurors. In this case, the report needs to be drawn up by a man with a highly-trained legal mind. Though ignorant of aeronautics, he should be quick to grasp the salient points of evidence, and to discriminate between what is pertinent and what is not. We must remember that, in the majority of important trials, the judge and counsel are dealing with subjects on which they are not experts. They are men with minds trained to grasp recondite subjects quickly and completely. Juries would be left very much at sea if judge and barristers were not men gifted with that ability. What, we may ask, did Sir John Simon know about Indian problems when he started to enquire into them? Yet, it is usually held that a lifetime of close study is all too short a time in which to gain a real insight into India. We feel not the slightest doubt that, in a very short time, Sir John Simon will have grasped and weighed all the considerations of structure, load, endurance, navigation, meteorology, and handling which may be concerned in answering the question why R 101 crashed to earth. There lies behind him the training and experience of a lifetime in grappling with questions of all descriptions, and, as every one knows, he has attained the first place in his profession.

There is another reason why we are particularly glad that this Court is composed of a man who is both impartial and strong. It is lamentable, but it seems almost inevitable, that the report must reflect upon the judgment of some one who has lost his life. Was the whole airship policy wrong? Was R 101 wrong in design? Was the meteorological information at fault? Was it injudicious to make a start on that night? Was the course selected not the wisest choice? Was the handling of the airship wrong in the circumstances? If any of these questions have to be answered in an adverse sense, there must, we fear, be some reflection on the judgment of one of the persons on board. If so, it would be a natural human weakness to desire to spare that reputation, and especially to spare the feelings of the bereaved. Yet, in the case of a disaster on the sea, and particularly in the case of a naval accident, the findings are made regardless of such considerations. An officer of the Royal Navy who loses his ship is, if he survives, court-martialled, and we feel it right that it should be so. It may be that in the case of aeroplane accidents we have been too squeamish. In reports at the end of a year it is stated that such a percentage of accidents was due to error of judgment on the part of a pilot, but this is not always made public after each accident.

In the case of R 101 we believe that the best and wisest thing will be to make it known who and what was chiefly responsible for the accident. A potential means of communication is at stake, and that is of more importance to the British Empire and to the world than the reputation of any one man, even though that man was highly respected and is deeply mourned. If this disaster is held, after what will be the most searching and impartial of inquiries, to show that there is some inherent defect in all airships in certain circumstances, then it is well that we should know it and stop the experiments. But if the crash was due to a fault in this particular design of airship which is not common to all others, or, again, if it was due to some fault in handling her which might have been avoided, then the airship case is not condemned by this tragedy. We must know these facts, if they can be discovered, and when we know them we can decide whether to go on with the experiment or not. For this reason, we particularly welcome the appointment of Sir John Simon.

It is somewhat more difficult to express much opinion about the two Assessors. Lieut.-Col. Moore-Brabazon is well known in the aeronautical world. He was the first Englishman to obtain his certificate and has a good knowledge of matters of the air. In a practical form he has not taken a very active part in flying in late years, and although perhaps his views regarding the future of airships may not be too optimistic, we have no doubt that Col. Moore-Brabazon will expunge all previous ideas from his mind and will sit and consider the evidence with perfect impartiality. We know practically nothing about Professor Inglis except that he is an eminent authority on mechanics and will be quick to grasp the mechanical points which may be raised.

Speaking about opponents of airships, we hope that some of the more notable ones will be allowed to give their opinions to the Court. We do not mean critics of the sort who said "I am sure there will be a big disaster with these airships," and now say "I told you so." That sort of person is about as helpful as the old lady who said that if man had been meant to fly, the Almighty would have given him wings. But a critic who can bring forward reasonable, or at least debatable, reasons why there is some danger inherent in airships which no human skill and ingenuity can obviate, that sort of critic will, we hope, be allowed to put his case before such a judge as Sir John Simon. We understand that Dr. Eckener will give evidence, and undoubtedly his brief will be to prove that airships can be made as safe as any other form of transport. It would be well, therefore, if the other side were also heard. Perhaps the present Court would not be the proper place for such a discussion. That will depend on what line of inquiry is ultimately adopted as the case develops and as the various experts are called and give their opinions. What we have in mind is that when the present Court has presented its report to the Government, supposing that that report leaves open the question of future airship policy, the Government may appoint a new commission to consider the whole question *de novo*. It is full time that those opponents of airships who have been so active in the correspondence columns of the press and elsewhere should have their case judged by an authoritative and impartial commission. Two successive Air Ministers have acted as sponsors for the airship development policy, and that fact is impressive. But one of them has lost his life, and it now seems proper that a commission should inquire into the whole matter. We should think it very appropriate if Sir John Simon were also placed at the head of such a commission.

THE LONG-RANGE AVIAN

Full Details of Kingsford-Smith's Machine

THE flight to Australia in 10 days which was completed recently, and with which we dealt briefly in last week's issue, has attracted the attention of the world, and the name of Kingsford-Smith is on the lips of all at the present time. By his flight Kingsford-Smith showed what can be achieved by a determined man, mounted on a good machine, driven by a reliable engine, and properly equipped for a flight of this nature. We have received from the Avro firm very full particulars of the long-range Avian (Gipsy II) used by Kingsford-Smith, and it is thought that the very thorough calculations made beforehand will prove of general interest. Space has not permitted us to publish the particulars in full this week, but the general description is given gelow, and the wealth of figures and data relating to the machine will be published in next week's issue. It is of interest to recall, in connection with the Kingsford-Smith flight to Australia, that Hinkler's remarkable flight in 1928, when he reached Australia in 15½ days, was made on the very first Avian ever built. That machine was driven by a Cirrus engine.—ED.

THE Long Range "Avro" Avian was designed to make an attempt to lower the record time of 15½ days from England to Australia, which had been established by Squadron-Leader Hinkler in 1928 in an Avro Avian.

Wing Commander Kingsford-Smith proposed to make the attempt after his successful completion of the circuit of the world, which he carried out on the three-engined Fokker—the "Southern Cross."

One of the conditions laid down was that the aeroplane should have a minimum range of 1,600 miles in still air. Another condition laid down by Wing Commander Kingsford-Smith was that the engine (Gipsy II) should run at 1,900 r.p.m. cruising.

Calculations were made to see whether these conditions could be obtained with a Standard Avian Mark IV M., and it was found that certain modifications would be necessary. It was, therefore, decided to build a machine containing features taken from the Standard Mark IV M Avian and the Sports Avian, and at the same time to increase the wing area slightly.

The increased wing area was obtained by increasing the span from 28 ft. to 30 ft. A standard welded steel Avian fuselage was used, with certain members increased in strength to take care of the extra weight of the full-loaded machine. A standard Sports Avian undercarriage was fitted, standard empennage and a standard engine mounting.

The standard 24-gallon centre section tank was also used. The front seat, controls and instrument board were removed and the space made available was utilised to house a welded aluminium fuel tank of 91 gallons' capacity, making the total fuel capacity 115 gallons.

KINGSFORD-SMITH'S LONG-RANGE "AVIAN": Three-quarter Front View. The engine is a De Havilland "Gipsy II."

A lay-out of the machine was made on this basis, and weight and performance estimates were carried out, the results of which are shown in the Appendix. (This will be published in the next instalment.—ED.)

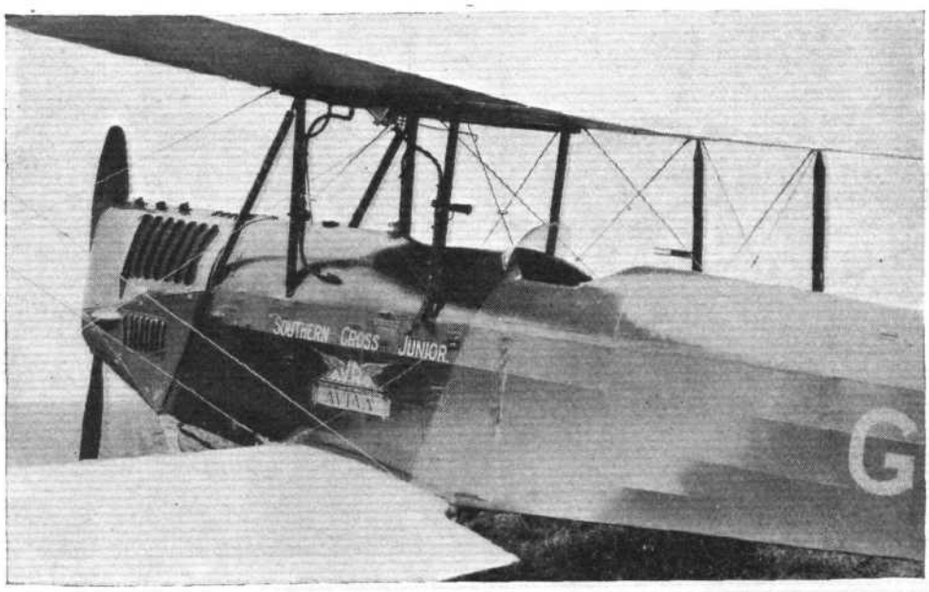
It was found that a still air range of 1,860 miles at an average cruising speed of 92 m.p.h. at 1,900 r.p.m. could be obtained, and this gave a good margin over the minimum requirements laid down by Wing Commander Kingsford-Smith. A top speed of 113 m.p.h. at 2,100 r.p.m. with full load was also indicated.*

The arrangement of the fuel supply system on the Long Range Avian is much more elaborate than that usually fitted to a light aeroplane. The arrangement adopted is such as to ensure almost complete immunity from breakdown.

As will be seen from the diagram, the fuel is carried in two tanks—a main tank of 91 gallons' capacity and an auxiliary gravity feed tank of 24 gallons' capacity. Both tanks are of heavy gauge welded aluminium construction, which produces the lightest and strongest tank possible. All piping throughout the system is "Petroflex" to ensure freedom from failure due to fatigue. An engine-driven A.C. fuel pump is incorporated.

The fuel system was arranged so that the following alternative feeds could be obtained :—

(1) From the gravity tank direct to carburettor.



COCKPIT AND NOSE OF THE LONG-RANGE "AVIAN": Extra fuel tanks were fitted, giving a duration of about 20 hours.

* On test, the machine gave a top speed of 115 m.p.h., and the cruising speeds at 1,900 r.p.m., were 92 m.p.h. with full load and 97 m.p.h. when the fuel load was practically exhausted.
The take-off run with full load was 360 yards.
The initial rate of climb was 480 f.p.m.

AVRO LONG-RANGE "AVIAN"
"Gipsy II" Engine

Dimensions

	ft.	in.	m.
Length overall	24	3	7·40
Wing span (top and bottom)	30	0	9·15
Wing chord (top and bottom)	4	9	1·45
Wing gap	5	0	1·52
Height overall	9	3	2·82
Airscrew diameter	6	2	1·88
Airscrew pitch	5	0	1·52

Areas

	sq. ft.	m².
Wings, with ailerons	262	24·35
Ailerons, total	21·8	2·03
Tail plane	19·7	1·83
Elevators	11·2	1·04
Rudder	7·9	0·73
Fin	3·7	0·44

Performance

Gipsy II engine, normal full power 110 b.h.p., at 2,000 r.p.m. Gross weight of machine: 2,225 lb. (1,013 kg.)

	m.p.h.	km/h.
Maximum speed at ground level	115	185
At 5,000 ft. (1,500 m.)	108	174
At 10,000 ft. (3,000 m.)	98	158
Minimum speed, near ground	50	80
Cruising speed, near ground	94	150
Endurance at 94 m.p.h. (150 km/h.)	20 hr.	
Take-off run, full load	365 yards (328 m.)	
Initial rate of climb	485 ft./min. (2·46 m./sec.)	
Time to 1,000 ft. (300 m.)	2·15 min.	
Time to 5,000 ft. (1,500 m.)	13·0 min.	
Time to 10,000 ft. (3,050 m.)	41·5 min.	
Service ceiling	10,000 ft. (3,050 m.)	
Absolute ceiling	12,500 ft. (3,800 m.)	
Wing loading	8·5 lb./sq. ft. (41·6 kg./m²).	
Power loading (normal)	20·2 lb./h.p. (9·22 kg./CV).	

Item Weights

	lb.	kg.	Totals lb.	Totals kg.
Wings				
Wings, with ailerons, interplane struts and bracing	268	122	238	122
Tail				
Tailplane and bracing	23	10·5	—	—
Elevators, rudder, fin and bracing	9	4·1	—	—
Undercarriage	—	—	32	14·6
Undercarriage	58	26·4	—	—
Tail skid	6	2·7	—	—
Fuselage	—	—	64	29·1
Fuselage, complete	314	143	—	—
	—	—	314	143
Total structure weight	—	—	678	308·7
Power Plant				
Engine with airscrew boss	295	134		
Exhaust pipes	3	1·4		
Airscrew	13	5·9		
Petrol tanks, piping and pumps	90	41		
Oil tanks and piping	6	2·7		
Miscellaneous	15	6·8		
Total power plant			422	191·8
Total tare weight			1,100	500
Load carried				
Fuel: 115 gals. (523 litres)	877	400		
Oil: 3·5 gals. (16 litres)	35	16		
Total fuel and oil			912	416
Pilot	165	75		
Spare airscrew	13	5·9		
Luggage, tools, &c.	35	16		
			213	96·9
Total gross weight			2,225 lb.	1012·9 kg.

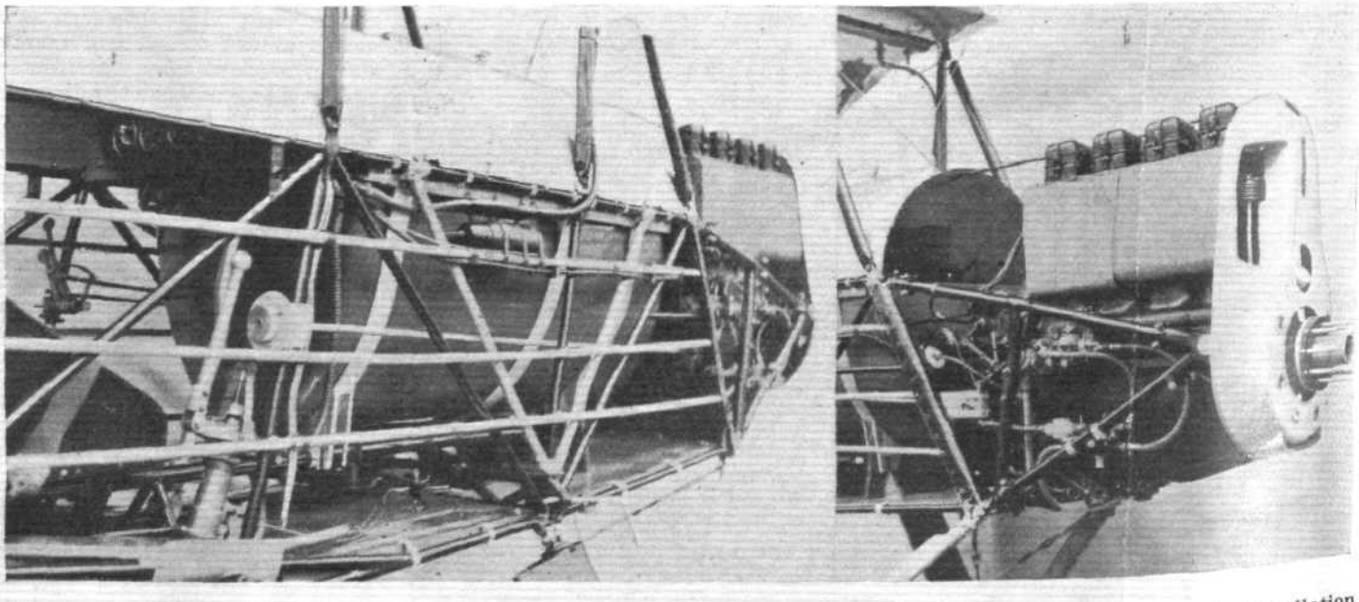
(2) From main tank via engine pump to carburettor.

The normal operation of the system was to set the 3-way distributor cock, so that the engine pump fed to carburettor and gravity tank, surplus fuel being returned to the main tank through an overflow pipe fitted with a prismatic flow meter, which gives a visual indication that the engine pump is functioning satisfactorily.

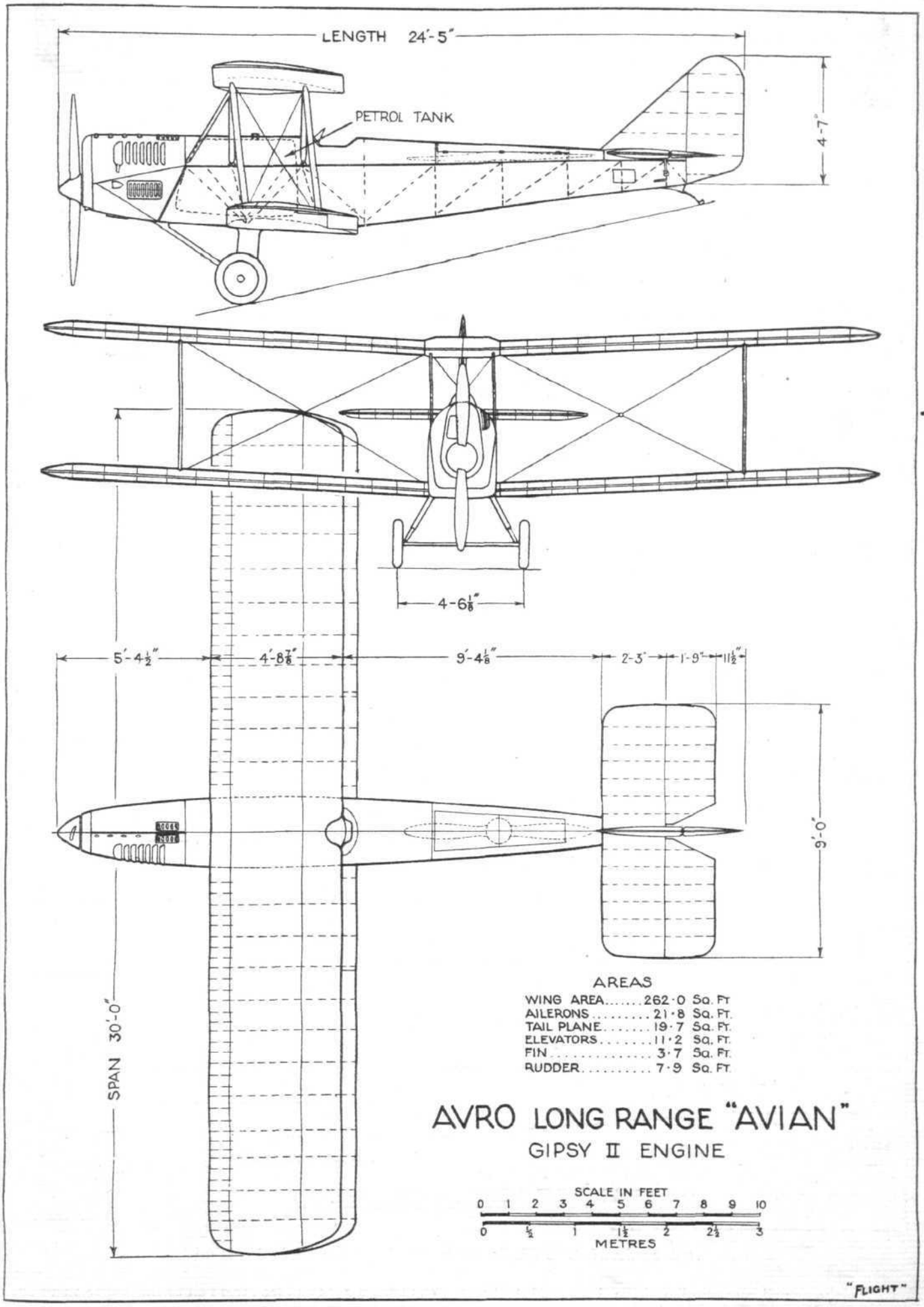
A Vickers hand pump was also fitted and this could be used to pump fuel from the main tank to the gravity tank in the event of failure of the engine-driven pump.

To assist in refuelling the plane from large drums, a 3-way distributor cock is incorporated in the hand pump circuit and a length of connecting hose supplied, so that the tanks can be filled from a drum placed at the side of the aeroplane, using the hand pump as a filling pump. A Vickers relief valve is fitted in the engine-pump circuit in order to ensure a constant pressure at the carburettor when direct feed from the main tank is used, and a non-return valve is incorporated in this circuit, so as to prevent loss of fuel in the event of failure of the feed pipe from the main tank. Shut off cocks are fitted in the sumps of both tanks.

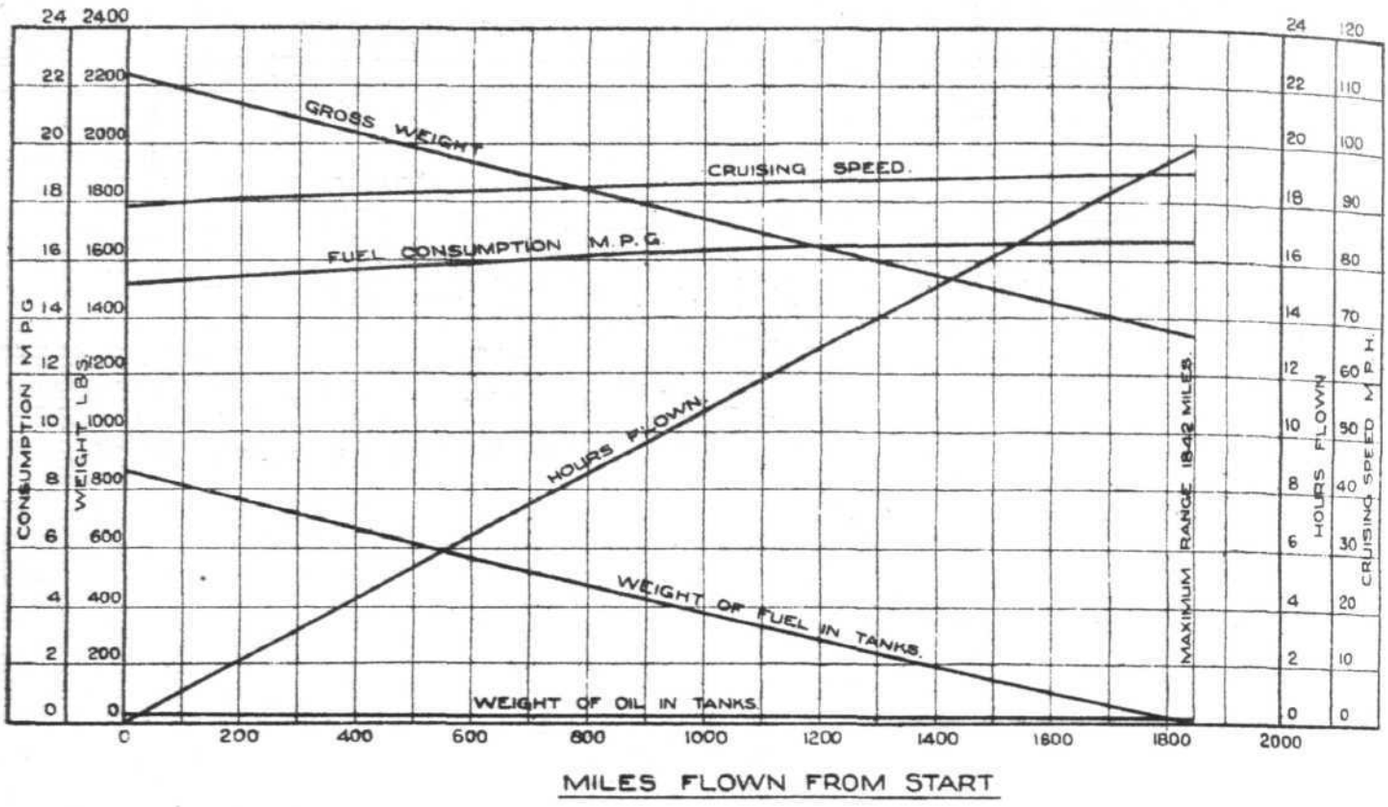
The oil supply is normally carried in the engine sump, and



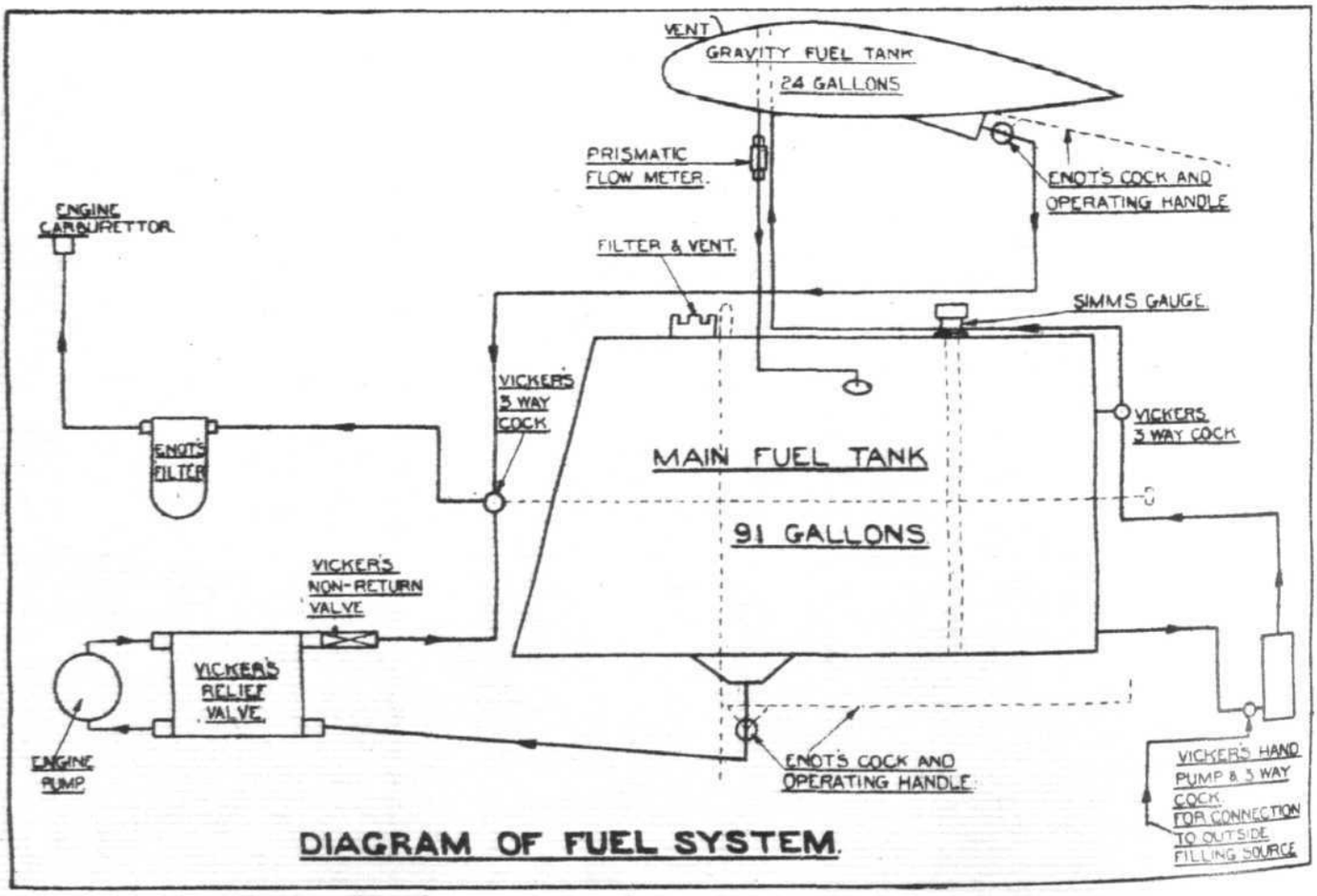
EXTRA TANKAGE: Two photographs, taken before the fuselage covering was put on, showing the installation of the extra large petrol tank, &c.



THE LONG-RANGE "AVIAN": General Arrangement Drawings.



THE LONG-RANGE "AVIAN": Curves of Cruising Flight in still air, with the engine throttled to 1,900 r.p.m.



THE PETROL SYSTEM: Diagram of the special installation.

owing to the low oil consumption of the Gipsy engine, it was considered that sufficient oil could be carried in the engine sump, provided everything was working satisfactorily.

It was decided, however, to incorporate a reserve oil tank holding 1½ gallons of oil. This is arranged so that the pilot can open a cock and feed fresh oil to the engine sump during flight, if required.

A drinking water tank, holding 2 gallons, is fitted in the locker for use in the event of the machine having to make a landing in some inaccessible spot where drinking water is

not available. A supply of emergency rations was also carried in the locker.

The spare propeller is stowed in the decking, aft of the cockpit, and a long door is fitted in the deck, so as to make this easily accessible, if required.

A number of engine spares and a few tools were also carried in the locker and a spare set of undercarriage bracing cables were also carried.

The only spare used throughout Wing Commander Kingsford-Smith's flight was one of the undercarriage cables, which was used to replace a cable which was strained during a landing in the dark at Singapore. The machine is very well equipped as regards instruments.

The instrument board is shown in one of the accompanying photographs, and was supplied by the Pioneer Instrument Company.

In addition to the complete range of instruments fitted to the dashboard, a Husun compass, supplied by S. Smith & Son, Ltd., was mounted at the side of the cockpit and this compass was used for the navigation of the aircraft. A turn and bank indicator, and also a climb meter, are incorporated in the instrument equipment to enable the machine to be flown "blind" and in the dark.

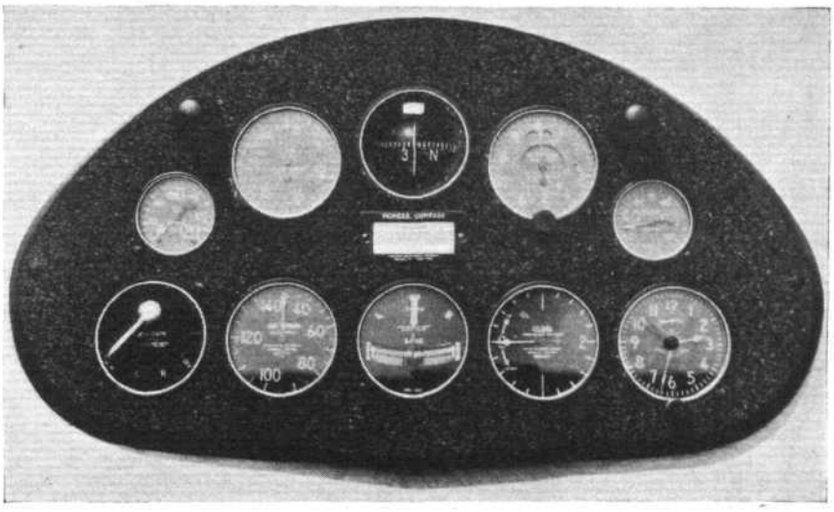
Flood lighting of the instrument board was supplied from flash lamp batteries, and the same batteries were used in the hand-inspection lamp, which was supplied. This instrument lighting proved very useful during the flight, as several starts and landings were made in the dark.

When fully loaded, the long-range Avian carries a load equal to its own weight, and under these conditions it takes off with a remarkably short run of 360 yards and climbs at 480 ft./min.

The machine is very easy and comfortable to fly and possesses a marked degree of inherent stability.

Wing Commander Kingsford-Smith was very pleased indeed with the flying qualities and general efficiency of the aeroplane, and its robust construction was proved by the perfect condition in which it completed the flight.

(To be concluded)



PIONEERING THE FLIGHT : The instrument board of Kingsford-Smith's "Avian."

R 101 INQUIRY OPENED

THE Inquiry into the cause of the loss of R 101 was opened on Tuesday, October 28, at the Institute of Civil Engineers, by Sir John Simon, assisted by Professor C. E. Inglis and Lieut.-Col. Moore Brabazon as assessors. The Attorney-General (Sir William Jowitt), the Solicitor-General (Sir R. Stafford Cripps), and Mr. Wilfrid Lewis, represented the Crown. Mr. P. L. Teed attended to watch the proceedings on behalf of the widow of Flight-Lieut. Irwin.

The Court stood in silence to express its grief at the tragedy and its sympathy with the relatives. Sir John Simon then read the terms of reference, and invited anyone who believed that he had well-founded information in his possession to communicate with the Court.

The Attorney-General said that he would put before the Court every scrap of evidence which existed. A body of French witnesses would be called, and it was hoped that Dr. Eckener would attend. Sir John said that he would be most grateful if Dr. Eckener would attend. The Attorney-General then sketched the history of airship development, explaining that R 101 was produced as a result of the inquiry into the loss of R 38, and was an experimental ship. He put in the memorandum prepared for the Imperial Conference of 1926 and also a memorandum prepared by Lord Thomson for the present Conference. The latter was a secret document but he had obtained permission to hand copies to the Court and to read out such passages as were material. There was a good deal of matter not dealing with the airship which was of a highly confidential nature. Sir John Simon confirmed that this secret matter had nothing whatever to do with the R 101 inquiry.

Sir William Jowitt then said that each of the two new airships was to have a capacity of 5,000,000 cub. ft., which was intended to give a gross lift of 150 tons, with a useful lift of 60 tons.

It had been intended that both should use fuel other than petrol, and the Tornado Diesel engines were the first of their kind. The disposable lift of R 101 was found to be only 40 tons, partly because the engines worked out at 8 lb. per h.p. instead of 5 lb. per h.p., giving a total weight of 17 tons instead of 9 tons. He handed to the Court the report of the Airship Stressing Panel, which was too technical to read out. He also produced the report of the Aeronautical Research Committee on the airworthiness of airships, presented in October, 1924, which he said was of the greatest importance because the whole construction of R 101 was based upon it.

Sir John Simon remarked that Col. Richmond and Major Scott were both members of the committee.

Turning to meteorology, Sir William described the method of reporting to the airship and said that the Court would have to consider if the disaster could have been caused by an error in the altimeter. Sir John added, "Or some failure to report from the ground some information that was vital." When the gasbag wiring was discussed, Professor Inglis said that he could not visualise the method from the drawings, and Sir John asked if a model could be produced. Sir William went on to say that he could put forward no theory to account for the disaster. He could put some possibilities, but some of the experts would say that they were not the cause. "Something must have happened, and it is for us to find out what did." He went on: "There is little doubt there was a violent explosion," and he distinguished between an explosion of hydrogen and a mere fire, suggesting that the airship struck the ground twice and that the explosive mixture of hydrogen and air had time to form between the two impacts. He then mentioned that in the wreckage an elevator cable was found broken. If it broke after the fire occurred, it had no significance, but if it broke before, it would put the elevator at neutral. A microscopic examination would be made to discover, if possible, whether this wire broke when hot or when cold.

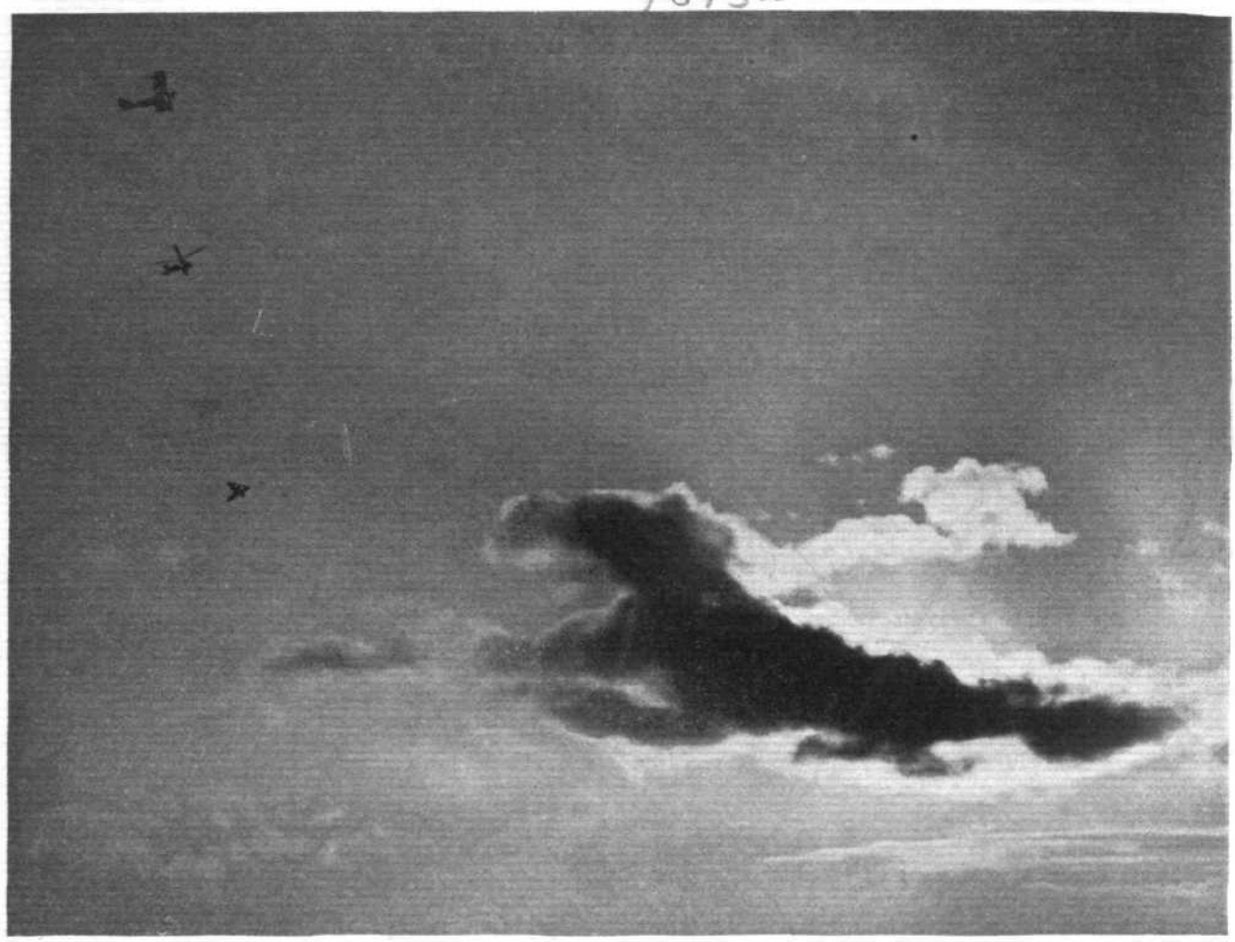
The lengthening of R 101 was described, which gave her a disposable lift of 53 tons. This work was commenced in July. Correspondence between Lord Thomson and the Director of Supply and Research (then Sir John Higgins) was quoted, in the course of which Lord Thomson, in June wrote, "I must insist on the programme of the Indian flight being adherred to, as I have made my plans accordingly." In September, Lord Thomson wrote, "I should like to be able to count definitely on starting for India during the week-end September 26-28. I ought to be back by October 16."

Sir John Simon asked for the logs of R 101 on her trial flights, and Sir William undertook to produce them. The log for the last trial flight had been lost in the wreck, but Air Vice-Marshal Dowdin had been on board and had described what took place.

Mr. Teed said that Flight-Lieut. Irwin had left a book which contained a number of reports on the flights, and he would endeavour to produce it.

The inquiry was adjourned.

9893a



The Handley Page "Gugnunc," the "Autogiro," and the Westland-Hill "Pterodactyl" "formating" at Croydon. (FLIGHT *Photo.*)

THE IMPERIAL CONFERENCE AT CROYDON

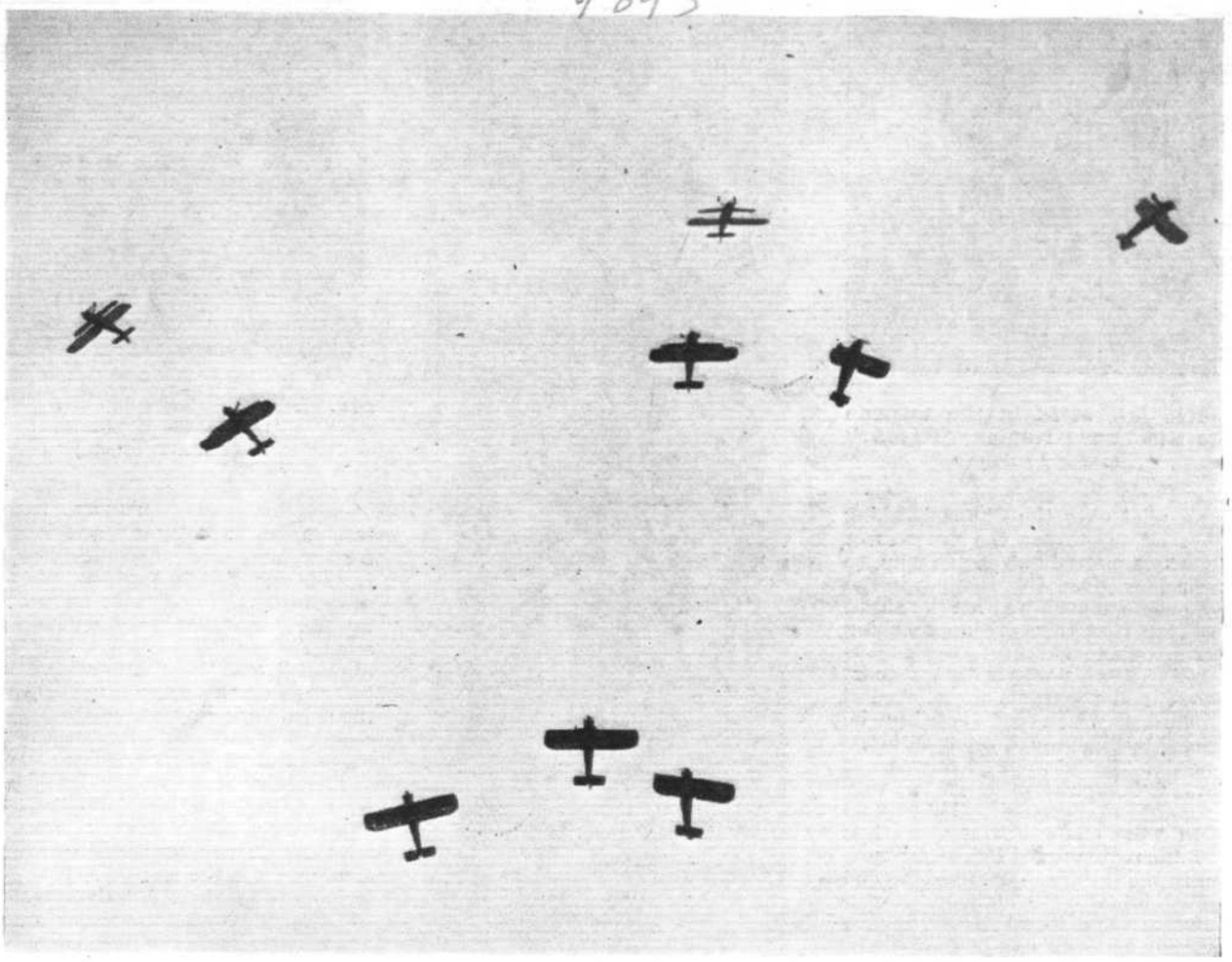
A Concentrated Extract of Hendon

A COUPLE of years ago an Australian cousin of mine came to London on a visit. He had been in the Australian Air Force during the War, and afterwards had been one of the original six pilots with whom Maj. Brearley opened West Australia Airways. So I naturally took him to Croydon aerodrome and showed him round. It made a curious contrast—a pilot from what was at the time the best and most useful airway in the world, looking at the best-equipped aerodrome in the world. The organisation simply fascinated him, and he drew a picture of his own recollections of arriving at an aerodrome on one of the stations between Perth and Derby, and often having to do all that was necessary to the Bristol Tourer himself. Since then air transport has made much progress, but still the Dominion airways are more useful than the cross-Channel services, and still they have to manage with far less elaborate equipment than Croydon can show. We understand that Germiston and Cape Town aerodromes will soon rival Croydon, but that has not happened yet. So it is only natural that the delegates to the Imperial Conference should consider a

9883

PROMINENT PERSONALITIES AT CROYDON: In the photograph on the left may be seen the Rt. Hon. J. R. Clynes, Lord Amulree, the Air Minister, the Rt. Hon. J. Ramsay MacDonald, Prime Minister, Mr. F. Montague, Under-Secretary of State for Air, and Mr. F. G. L. Bertram, D.D.C.A. The group on the right shows the Prime Minister in conversation with the Mayor of Croydon and Air Chief Marshal Sir John Salmond, Chief of the Air Staff. (FLIGHT *Photos.*)

9893



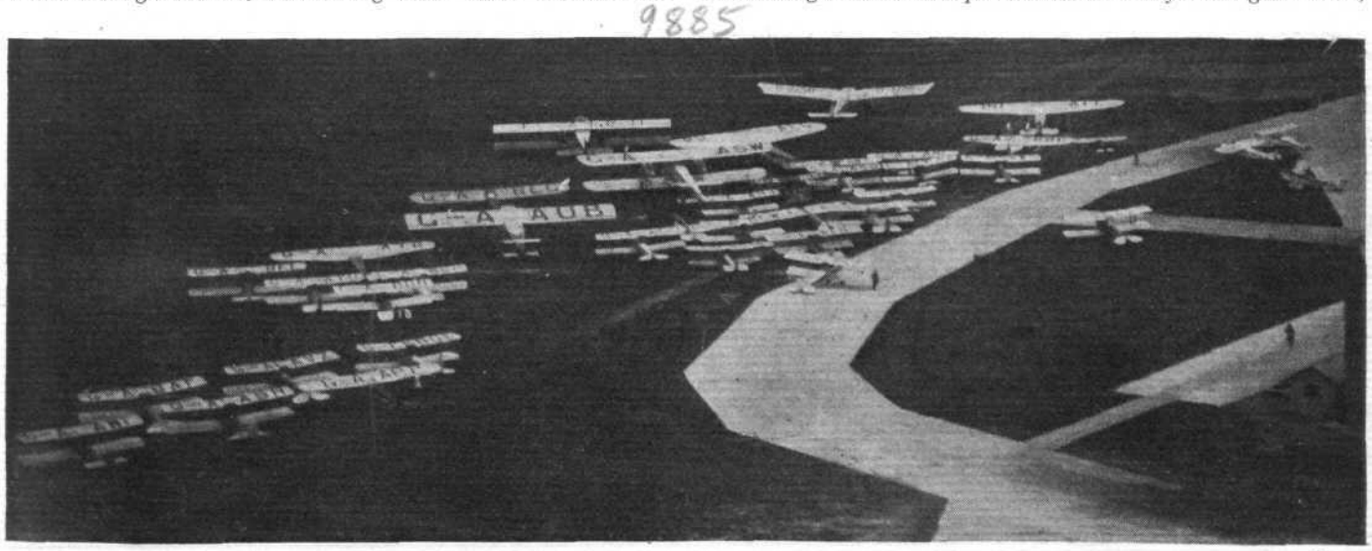
THE "PRINCE OF WALES FEATHERS": Siskins of No. 43 Squadron, commanded by Sq.-Ldr. C. N. Lowe, breaking the cords with which they were tied together during the earlier part of their display of formation flying. (FLIGHT *Photo.*)

visit to Croydon one of the most instructive functions of their time in London.

This function took place on Saturday, October 25, on a cold and windy day, with several bursts of heavy rain. Perhaps that was why all the Premiers could not manage to put in an appearance, but deputed their colleagues to go in their stead. The Premiers of Australia and New Zealand were there in person, and Mr. Ramsay MacDonald flew over from Northolt in a Fairey 3 F belonging to No. 24 (Communications) Squadron, and afterwards left in the same machine for Halton, which is convenient for Chequers. There was quite a gathering of Indian delegates there, and one venerable Mussulman gentleman, whose long white beard matched his white *pagri*, would have been the most conspicuous figure on the ground had not Mr. Montague upheld the sartorial honour of Great Britain by turning up in a top hat. Lord Amulree received the visitors, and Air Chief Marshal Sir John Salmond helped to do the honours, but there were no formal speeches.

In the morning the visitors were shown round the administrative buildings of the airport, and those who wished to do so made short flights in Argosy machines supplied by Imperial Airways. The air seemed to be considerably bumpy. Doubtless the control tower was one of the most interesting things which the visitors saw. It is always fascinating to watch the procedure and study the organisation,

9885

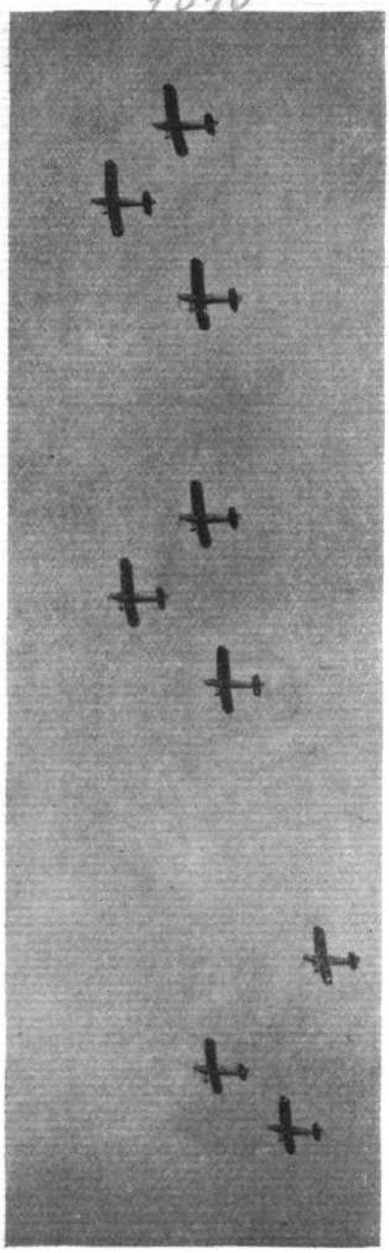


CIVIL VISITORS: An aerial view of some of the civilian machines which were to be seen at Croydon during the Display. (FLIGHT *Photo.*)

9887

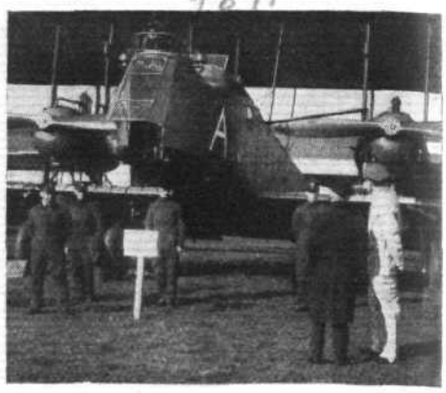
Delegates interested in the torpedo on the Blackburn-Napier "Ripon."
(FLIGHT *Photo.*)

9890



No. 33 Bombing Squadron: Hawker "Harts" (Rolls-Royce engines) in flights abreast.
(FLIGHT *Photo.*)

9891



Mr. Scullin inspects the Vickers "Virginia" Mark X.
(FLIGHT *Photo.*)

to hear a pilot over the Channel asking for his position, to see the progress of each machine plotted out on the map, to hear warnings given to machines in the air that such and such weather lies ahead of them, or that they are approaching another aeroplane and must keep a look-out for it. In this way is air transport made safe, and the pilots are relieved of every burden which can possibly be shouldered by the ground organisation.

A visit to the machine park was not an attractive expedition after the rain had soaked the ground. Those who ventured were enabled to see no less than 37 different types of British aircraft. Naturally the "Fury" attracted a good deal of attention.

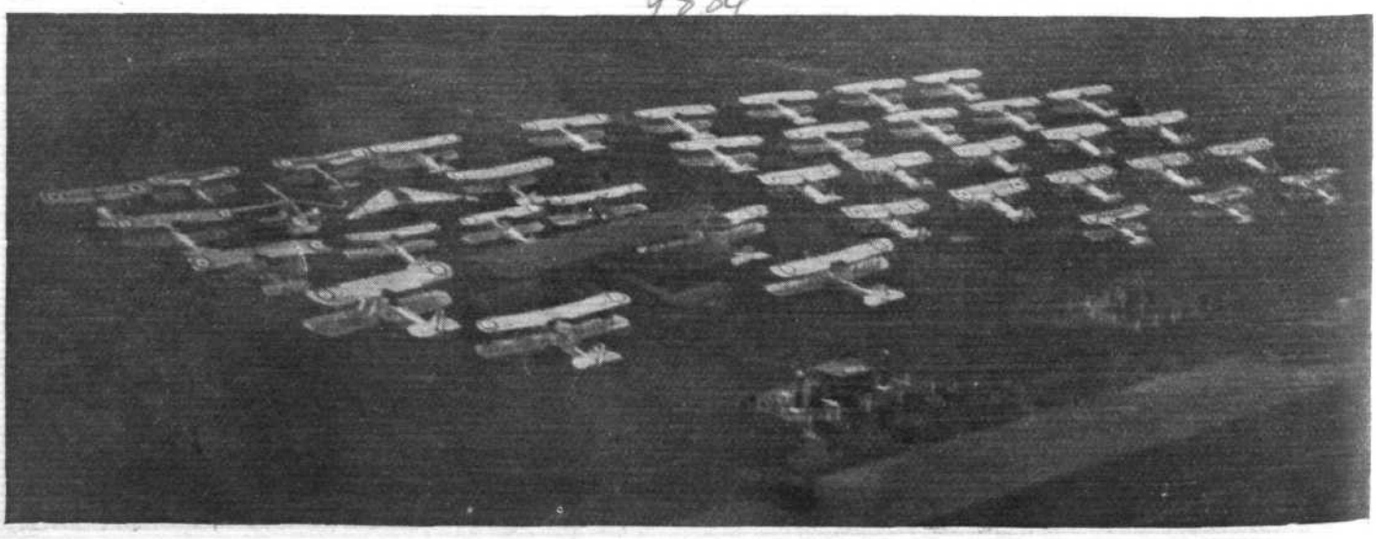
After lunch the Royal Air Force gave an excellent little display of four items. First, the two Gamecocks of No. 23 Fighter Squadron, piloted by Flying Officers J. F. X. McKenna and D. S. Macdonald, repeated the show of aerobatics which they gave at Hendon, flying towards each other and performing the same manœuvre at the same time. Considering the roughness of the weather, this display could hardly have been better. The second item was one which had not been seen at Hendon, for No. 33 Bomber Squadron showed off their Harts in some beautiful formation flying. The Hart, as readers of FLIGHT are well aware, is the best day bomber in the world, and No. 33 B.S. is the only squadron which has so far received this type. This time the Harts went up in "squadron formation." Unfortunately, one machine had slight trouble and had to land, but the reserve machine immediately took off and caught up the formation very smartly. The second movement was in "flights abreast," and the third was in "flights astern." In this formation the squadron made a very impressive dive over the aerodrome and zoomed up before breaking up and landing by flights.

The third act was the Harlequinade, by the Gugnunc, the Autogiro, and the Pterodactyl. The earliest Pterodactyl, with the Cherub, was used on this occasion, and it is the more effective for slow flying. The three Farnborough pilots, Flt.-Lieuts. C. E. Maitland and A. E. Rogenbach and Flying Officer H. H. Leech, seemed to handle the weird craft better than ever. After processing round in flight formation, they headed into the wind, and had a competition at standing still in the air without losing height. It was a perfectly amazing show, and at one time the Autogiro was actually being blown backwards.

Finally, No. 43 Fighter Squadron repeated their exhibition of flying with the wing tips in each flight, tied together. We only hope that the day will produce some effect by increasing the enthusiasm for air transport, and particularly inter-Empire air transport, in the minds of the delegates to the Imperial Conference.

F. A. DE V. R.

9884



THE ROYAL AIR FORCE CONTINGENT: An aerial view of the service machine park. (FLIGHT *Photo.*)

NEW GEARED AND SUPERCHARGED BRISTOL "JUPITERS"

Moderately Supercharged Types X.F.AM. and X.F.BM.

UNTIL recently, engines for aircraft could be conveniently grouped in two main classes: One developing maximum power at sea level only, and suitable for commercial aircraft; and the other developing, or maintaining, maximum power at considerable altitudes and suitable for service machines.

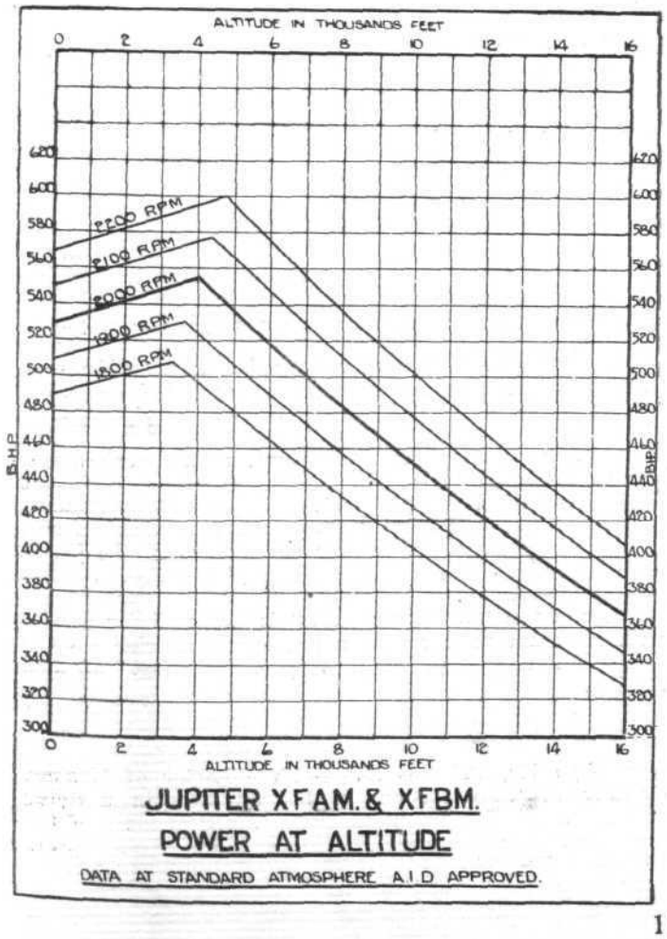
During the last few years, the developments in the latter class, and particularly in the superchargers, which are now almost universal on these engines, have resulted in the performance gap between the two classes being widened to such an extent that the introduction of an intermediate class of engine for use in aircraft where a good power output is required, both at sea level and at altitudes up to approximately 10,000 ft., was desirable.

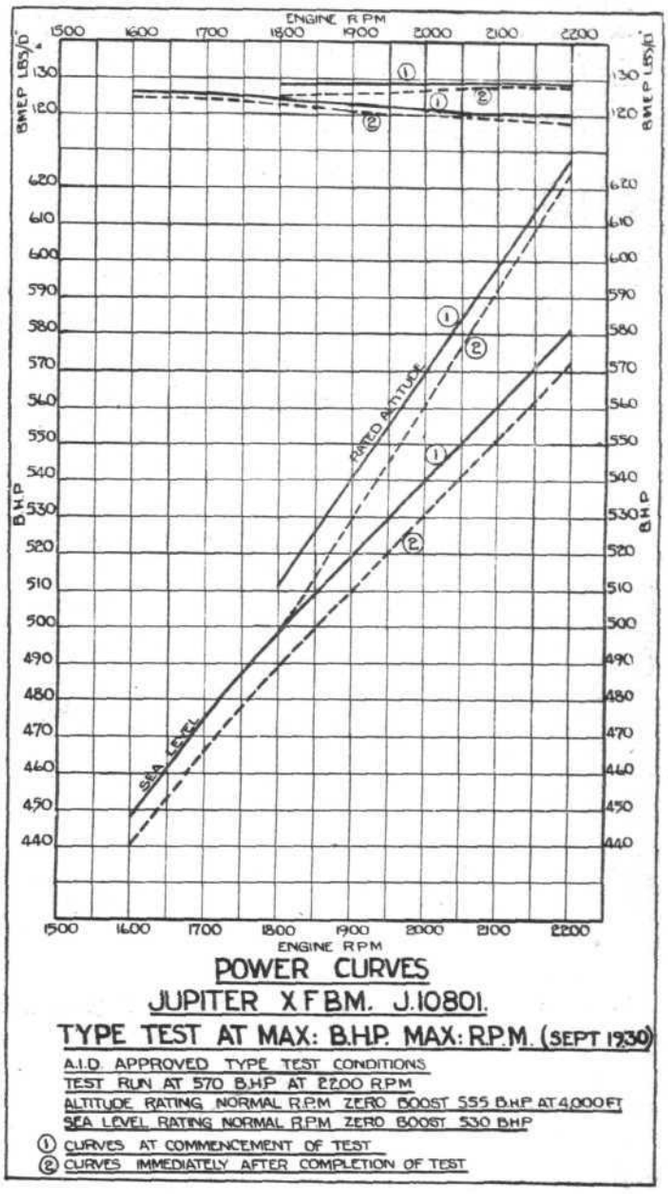
Amongst aircraft in this category are the general purpose class of service machines and seaplanes, and certain commercial machines and air liners operating over routes which involve the crossing of mountainous districts, and the taking off, with full load, from aerodromes in these districts.

It is to fill this requirement that the Bristol Company have introduced the Bristol "Jupiter" Series X.F.AM. and X.F.BM. engines, which, apart from the ratios of the propeller reduction gear, are similar. The new engines are basically similar to the Bristol "Jupiter" X.F., a high performance service engine, with the important exception that the supercharger is of the moderate speed type, the impeller running at only 70 per cent. of the speed of the "Jupiter" X.F. impeller, and permitting full-throttle operation at approximately 5,000 ft.

The performance of this engine, compared with the equivalent normally aspirated engine, has led Imperial Airways, Ltd., to select this type for their new four-engined Short flying boats, which are to be used on the new Empire Air Route between London and Capetown, and also for the large new Handley-Page landplanes which are to be used on the route to India. In both cases, high performance at full load, at high altitudes with one engine out of action is essential, and could not be attained with naturally aspirated engines without considerable reduction of the paying load.

That these engines mark a big step forward for commercial aviation is evident by the comparative performance, and





THE BRISTOL "JUPITER" SERIES X.F.BM.

Type	9-cyl. air-cooled radial, with medium ratio supercharger and airscrew reduction gear.
Bore and stroke	5¾ in. by 7½ in.
Total swept volume	1,753 cu. in. = 28·7 litres.
Propeller	Left-hand tractor.
Propeller speed	0·5 engine speed.
Normal r.p.m.	Engine 2,000. Propeller 1,000.
Maximum r.p.m.	Engine 2,200. Propeller 1,100.
Rating at normal r.p.m.	555 b.h.p. at 4,000 ft.
Power at maximum r.p.m.	600 b.h.p. at 5,000 ft.
Carburettor	Bristol triplex.
Ignition	Dual 2 H.T. magnetos.
Ignition control	Automatic variable.
Fuel	D.T.D. 134.
Oil	D.T.D. (mineral) 109.

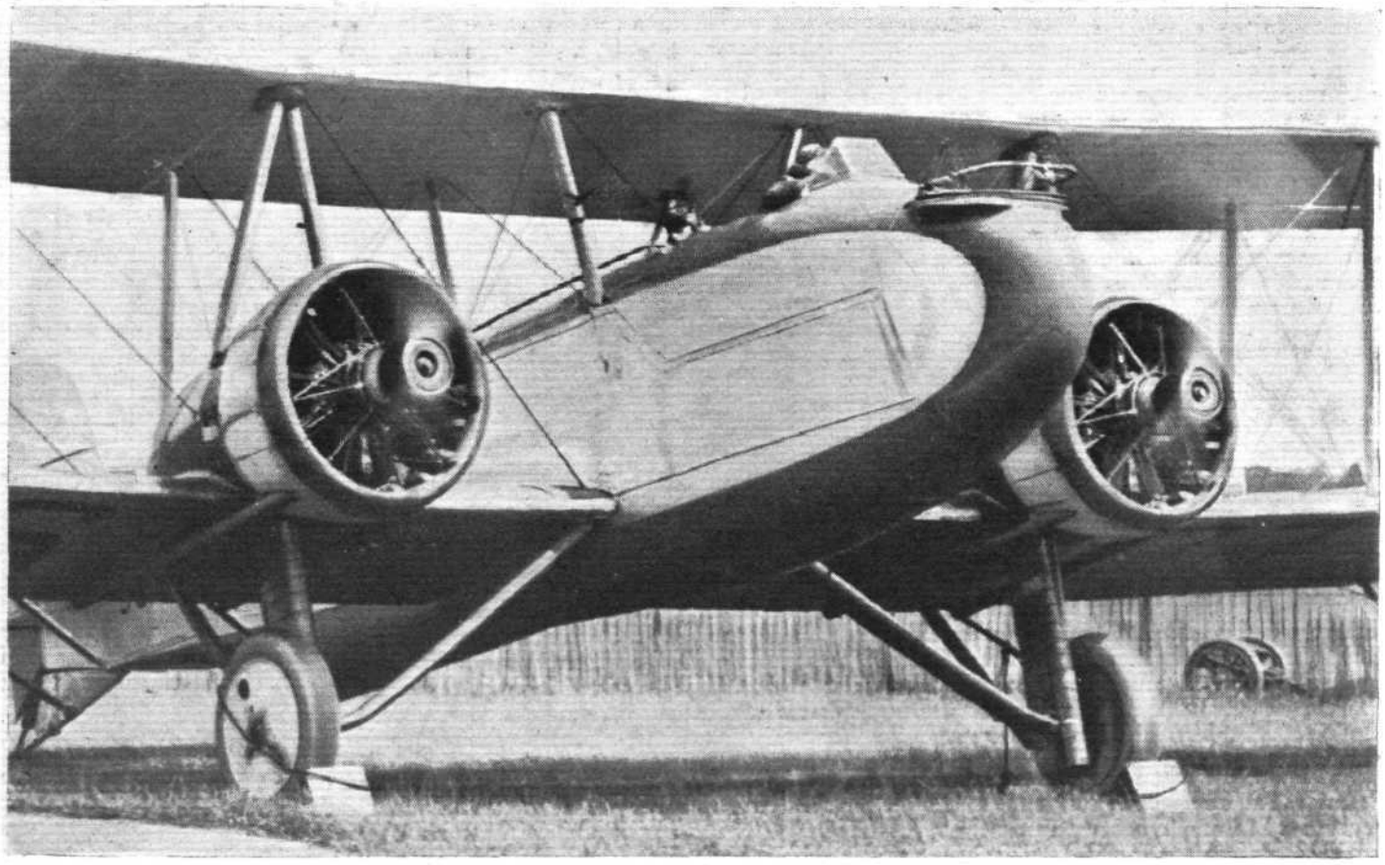
Jupiter X.F.AM

Propeller speed	0·656 engine speed.
Normal r.p.m.	Engine 2,000. Propeller 1,312.
Maximum r.p.m.	Engine 2,200. Propeller 1,443.

that they possess the high standard of reliability characteristic of the "Jupiter" has been demonstrated by the successful completion of a rigorous type test, carried out for Imperial Airways, which included, amongst other unusually searching investigations, 50 hours' running at maximum power and maximum permissible revolutions per minute. The fact that the Bristol Company readily undertook to subject the engine to this test is an indication of their confidence in their latest product.

That economy of operation has not been sacrificed is evidenced by the fact that on test, under the cruising conditions laid down by Imperial Airways, the fuel consumption was under 23 gallons per hour, and the oil consumption under 5 pints per hour.

The test was completed in a series of 10-hour, non-stop runs at an average sustained power of 570 b.h.p at 2,200 r.p.m., while for the high-power test at the completion, the engine developed 622 b.h.p. at 2,200 r.p.m.



THE LATEST "SIDESTRAND": The engines are Bristol "Jupiter" X F's. Note the Townend rings.

AN IMPROVED "SIDESTRAND"

Latest Version Fitted with "Jupiter" XF Engines

SINCE Boulton & Paul, Ltd., of Norwich, first introduced their "Sidestrand" twin-engined bomber, several versions have been produced, each new version representing an increase in performance and general utility. It may be recollected that in a detailed description of the first "Sidestrand" (*see* FLIGHT of March 29, 1929) the conclusion was arrived at that that machine was an exceptionally efficient one, aerodynamically, for a twin-engined aircraft. With a gross weight of 8,850 lb. (4,025 kg.) the "Sidestrand I" had a top speed of 130 m.p.h. up to about 9,000 ft. The "Sidestrand I" was followed by the Mark II, and that in turn was followed by the Mark III, with "Jupiter" VIII engines. In the meantime the gross weight increased in accordance with increasing requirements, and in the "Sidestrand III" had reached 10,200 lb. as compared with the original figure of 8,850 lb.

More recently the "Sidestrand III" has been equipped with "Jupiter" XF engines, the fitting of which has, for the same gross weight, brought about a very considerable increase in performance. Another gain in performance has resulted from the fitting of Townend rings over the engines. It may be recalled that recently Boulton & Paul, Ltd., acquired the sole rights for the manufacture of these rings, and in the "Sidestrand III" with "Jupiter X F" engines the Townend rings have, it is estimated, been responsible for a gain in speed of something like 10 m.p.h. at 20,000 ft.

The extra speed now possessed by the latest "Sidestrand III" is believed to have made that machine one of the fastest, if not actually the fastest, heavy class of service type in existence.

As the machine is the latest type, actual performance figures may not be given, but the makers believe that none of the standard fighting aircraft is capable of overhauling the new "Sidestrand III" at its normal operating altitude. Some of the very latest fighters are thought to be just a shade faster than the "Sidestrand III," but these are not yet in general use.

Although the "Sidestrand III" is designed for service work, it would appear that a machine somewhat on the same lines might prove a very useful fast air-mail machine.

Well-known War Aces Killed

As a result of a flying accident on October 20, Col. Hoppe, of the 12th Aviation Regiment, and his observer, were killed, and France has lost one of her best-known war aces. Known as "The Corsair of the Air," he carried out many big raids, and was awarded the Legion of Honour. Germany has also lost one of her war aces in a flying accident when Herr Monicke—who was a member of the Richthofen Circus—crashed in a new machine he was testing recently at Augsburg.

The AIRCRAFT ENGINEER

FLIGHT ENGINEERING SECTION

Edited by C. M. POULSEN

October 31, 1930

CONTENTS

TECHNICAL FEATURES OF THE AIR MAIL.

By Frank Radcliffe, B.Sc., A.R.Ae.S.

(*Continued from p.* 70.)

Now let us look at some of the requirements for a modern mail land 'plane. The following is suggested as being reasonable :—

Cruising speed = 150 m.p.h. ∴ top speed = 178 m.p.h.
Range in still air = 750 miles.
Pay load in the form of mail bags = 1,000 lb.

The following indicates what would be essential as regards equipment :—

Crew : two pilots, one to act as navigator, postal operator and wireless operator.
Wireless equipment (transmission and receiving).
Navigation equipment.
Night-flying apparatus.
Postal apparatus for collecting and dropping mails.
(The weight of all the above equipment could be assumed to be 800 lb.)

It will be evident at once that our mail 'plane, whilst having the performance of a modern day-bomber, will be of a very much bigger class, as the disposable load (ex fuel) will be approximately 1,800 lb. The actual size will be left for consideration in a subsequent article.

(*d*) *Aerodrome and Ground Equipment.*—If the technical development of the aeroplane presents difficulties, then the demands of the air mail service from an operational point of view seem overwhelming if 100 per cent. efficiency is to be obtained. For convenience, the problems will be mentioned in the following order :—

(1) Meteorological.
(2) Night flying.
and (3) " Blind " flying.

(1) *Meteorological*

On our assumption that flying stages will be of at least five hours' duration, it seems necessary that information should be available to the navigator at very frequent intervals relating to the weather conditions. A fixed aerial appears to have decided advantages over a trailing antenna inasmuch as it allows of continuous radio-communication when flying low. In the U.S.A. information on the weather is transmitted by the Chamber of Commerce at 15-minute intervals on a long wave-length over sections of 150-200 miles' radius, and many of the operating companies have a private network of short-wave stations for carrying on a two-way communication with their own aircraft.

(2) *Night Flying*

In addition to the information regarding the weather, that wireless makes possible, the pilot needs guidance along his route when flying by night, and here the problems arise which still await solution. Aerial lighthouses and beacons are suggested by some as a means of meeting the difficulties of night flying, and these have been largely employed in America. They are expensive to instal, and have the disadvantages that fog and low clouds will obscure the lights, thus rendering the lights ineffective to the aircraft that fly above the fog or clouds. It is of interest to note that the weather conditions, whilst being favourable to the light system in the U.S.A. would be less so in Europe. Undoubtedly there are many sections of our Empire routes that will need a lighting system, and, given the right meteorological conditions, the results should be very satisfactory.

The aerodromes require suitable night landing equipment, and the following units appear necessary (5) :—

I. *Location Beacon.*—Easily recognisable Neon tubes giving out definite flashes.

II. *Landing Floodlight.*—For illuminating the surface of the aerodrome at night. As the pilot always desires to land against the wind, it is mounted and made as a mobile unit. The floodlight is required to have a large horizontal spread with a very small vertical divergence.

III. *Boundary Lights.*—Consisting of flashing red or amber lights mounted on a low standard with a joint at the base for safety in the event of an aircraft colliding with it.

IV. *Obstruction Lights.*—For denoting danger spots on or near the aerodrome. The range of visibility of this class of light, in normal conditions, is about 3 miles, and a portable acetylene red lamp is used for temporary obstructions ; whilst electric lamps mark buildings and telegraph poles.

V. *Wind Indicators.*—Suitably illuminated, are necessary for guiding the pilot, and these take the form of a horizontal T.

(VI) *Ceiling Lights,* which take the form of searchlights, are useful for finding the height of clouds. This information

can then be forwarded to meteorological stations for inclusion in the weather bulletin, thereby indicating the maximum height at which flying must be carried out if the aerodrome or route lights are to be seen.

(3) "*Blind*" *Flying*

This term is intended to cover flying in fog, in conditions of poor visibility due to clouds, and along a night route not marked by light beacons. This section of practical aeronautical development is the one that is requiring the most careful investigation at the present time, for on its successful accomplishment depends very largely the future of commercial night flying. Its problems are concerned with the devising of instruments that will indicate immediately :—

(i) The course an aircraft is taking relative to the earth ;
(ii) The altitude at which the aircraft is above the ground ; and
(iii) The attitude of the aircraft relative to the true horizon.

A few notes on the problems will probably be of interest. (The enquiring reader is referred to recent issues of "Aero Digest" for information on what has been achieved in America in this direction.)

(1) The present method of communicating direction with aircraft in this country, and in operation on the European routes is worked from ground stations by means of wireless telegraphy (6). There are at present three stations, viz., Croydon, Lympne, and Pulham, and the results during 1929 have continued to be entirely satisfactory.

(2) At present no entirely satisfactory method of determining the altitude of an aircraft above the ground exists, so that a knowledge of the country over which flying is contemplated would be presumed (or else, flying would need to be carried out at high altitudes). There is need, therefore, for extensive research in this field.

(3) The problems covered by this group have to deal with the flying attitude of the aircraft in three dimensions, and whilst of supreme importance, finality has by no means been reached ; in fact, their solution appears still to be a long way off.

RECAPITULATION

Looking broadly at the various problems which arise in connection with both the aircraft and their operation, it would appear that :—

(1) The solution of the problems dealing with the design of the aircraft themselves are more advanced than those dealing with the more difficult phases of flying, such as "blind" flying.

(2) The future of commercial flying seems to be in the hands of the research wireless engineers.

(3) Means of collecting or dropping mails whilst in flight will create very great difficulties if 100 per cent. efficiency is desired.

(4) Speed alone will have to be the essence of the air mail service if it is to be an everyday economic fact.

(5) There will have to be a generous co-operation on the part of all sections which make up an air mail service if progress is to be accelerated to its fullest extent.

(To be continued)

References :—

(5) Information has been supplied by Chance Bros. and Co., Ltd., Marine and Aerial Lighthouse Engineers, Birmingham.

(6) Fuller details on these matters will be found in the following papers :
"Practical Navigation of Aircraft," Capt. F. Tymms, M.C. R.Ae.S. Journal, May, 1925.
"Landing Aircraft in Fog," Flight-Lieut. H. Cooch. R.Ae.S. Journal, June, 1926.

FLOATS FOR RACING CRAFT

By WILLIAM MUNRO, A.M.I.Ae.E.

It may be recollected that some years ago Mr. Munro, who was at that time on the Technical Staff of the Gloster Aircraft Co., contributed some articles on seaplane stability calculations. He then went to the United States, where he took up the post as chief engineer to the Towle Aircraft Company, and while there did a considerable amount of work on flying boats and amphibians. Mr. Munro has now returned to England and joined the Technical Staff of the Supermarine Aviation Works at Southampton.

In view of the fact that it has been decided to build a new seaplane testing tank at an early date in U.S.A., and that similar activity has already commenced in Canada, the writer hopes the following notes may be of interest and some value.

The subject of float or pontoon design may be considered as having three main divisions :—

(1) Design suitable for commercial machines.
(2) Design for fast ships of the racing type.
(3) Design of wing-tip floats or sponsons.

Having designed for any one of these types, a tank test is the final criterion of the likelihood of success which justifies actual building.

In many cases, however, where a sufficiency of data is available regarding previous successful ships, tank tests are dispensed with by the manufacturer on the score of cost. It cannot be emphasised too highly that where any radical departure from well-known type is contemplated, tank tests are not merely instructive but essential for clean running, good performance, absence of porpoising tendencies and actual safety.

It is proposed then to deal briefly with the characteristics and construction of the flotation gear suitable for high-speed craft, capable of travelling at speeds of over 300 m.p.h. with correspondingly high landing and take-off speeds. These notes will indicate the general trend of successful float design for this particular type of craft, but as each particular ship proves in hard experience to have its own particular vices, it is emphasised again at the risk of being tedious that no matter what data a designer may possess, a tank test is the safest and often the cheapest proof of the correctness of his deductions.

Design

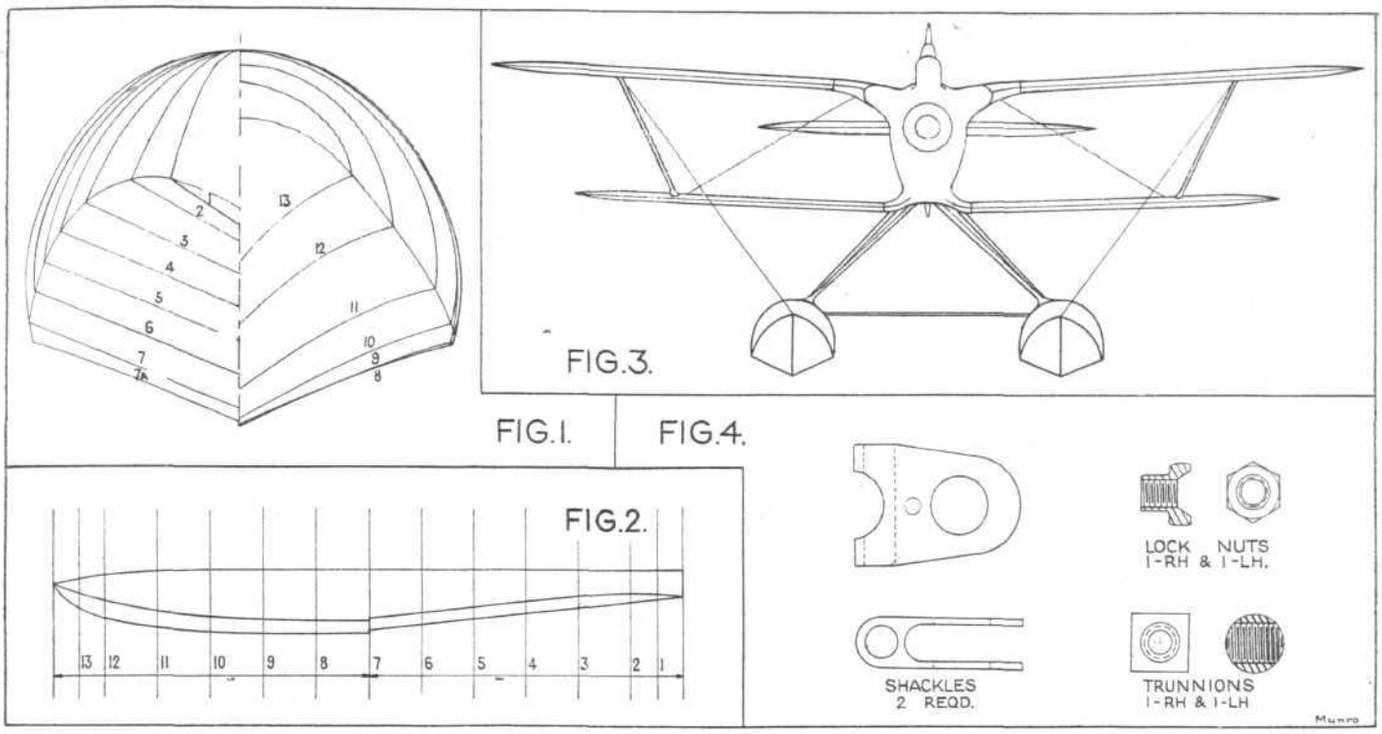
It will be readily agreed that when building the class of seaplane under consideration, the ordinarily vital matters of detail design suitable for production, such as the elimination of panel beating or "bumping," are of necessity forced to take a second place, and the question of design approached from a much different viewpoint. Aerodynamic considerations may be said to outweigh the cost problem and refinement of line is even allowed to impair to some extent the hydrodynamic performance, particularly in regard to step depth. Every effort is made to reduce the step size to a minimum, and yet have a step depth suitable for the getting off speed of the machine.

In certain tank tests made for floats for high-speed craft a depth of step of 1 in. was tried out. The tests showed that this depth was insufficient. However, up to a certain point reduction of step depth is in line with the requirements aimed at, as a relatively deep step is necessary for low getting off speeds and a shallower one for higher taking off speeds. In view of the small wing area of the typical racing machine, the planing action has to be delayed and this is done by having a narrow beam and a small step area. As already stated there is a safety limit to the step reduction which determines the compromise in design to suit aerodynamic efficiency and suitable performance on the water. Attempts have been made to fair off the step, but to one's knowledge this has not proved successful in regard to water performance.

The coefficients suggested as desirable are as follows :—

1. *Midship Area Coefficient*, which is the ratio of the area of the midship section of the float to the rectangle which encloses it.

This coefficient would be about 0·7.



2. *Coefficient of Fineness of Water-plane*, which is the ratio of the water-plane area of the float to the rectangle which encloses it.

This coefficient would be 0·6.

3. *Block Coefficient*, which is the ratio of the volume of the float to the volume of a block having the same overall length, same extreme breadth and same extreme depth.

This coefficient would be 0·435.*

Reserve Buoyancy

As would be expected, the frontal area of floats for racing craft is made as small as possible, and the amount of reserve buoyancy is cut considerably from the 90 per cent. to 100 per cent. generally used for commercial craft. This figure may be as low as 60 per cent. In production float work the wall-sided float with cambered deck is making strong headway and the essential difference in line for speed ships is best illustrated by the body plan shown in Fig. 1, and the streamline type of profile indicated in Fig. 2. These are not scale drawings and it would be misleading to accept them as such, but they give a very good idea of the characteristics found necessary in practice. As is well known to students of float design, the bow shape and angle of vee-bottom are of primary importance.

Metacentric Height

Another important point in which the make of float under consideration varies from the normal is the amount of transverse metacentric height deemed necessary. The G.M. or distance between centre of gravity of machine and the metacentre in ordinary cases ranges in the neighbourhood of $1{\cdot}1\sqrt[3]{W}$ ft., where W equals displacement of ship in lb. As the position of the metacentre is determined by the ratio $\frac{I}{V}$, where I equals the moment of inertia, and V equals the displacement, it will be clear that starting off with a narrow beam pontoon for the reasons already given, and maintaining the usual ratio of lengths to breadth then either the track between floats has to be excessive, resulting in a heavy undesirable undercarriage and increased resistance, or the ratio $\frac{I}{V}$ will give a value smaller than usual and less static stability in a transverse direction. The latter is the condition generally accepted and the values of transverse and longitudinal metacentric height are approximately indicated in Fig. 5. The figures below show approximately the results which might be expected from wind-tunnel tests of clean floats suitable for racing seaplanes of about 3,000 lb. weight :—

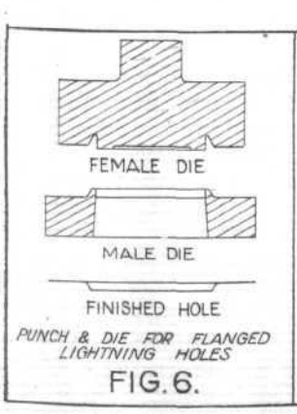
Step Depth	Lift at 100 ft./sec.	Drag at 100 ft./sec.	Drag in lb./ sq. ft.	Drag Co-efficient
2-in.	3·2	6·0	1·5	0·06
1-in.	3·38	5·42	1·31	0·056

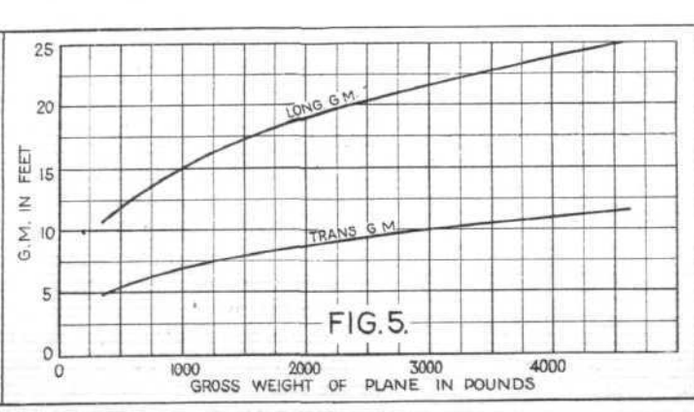
Construction

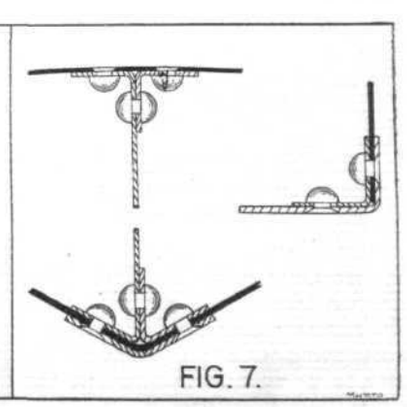
The following notes on construction may be of interest.

The pontoons are all-metal—Alclad—and finish given by the anodic process. A centre line bulkhead suitably

* See also "Seaplane Stability Calculations" by Wm. Munro, February 23, 1928, in FLIGHT SUPPLEMENT AIRCRAFT ENGINEER, and March 29, 1928.







lightened is fitted, which is continuous from bow to stern and the skin is supported by transverse frames and bulkheads made in two pieces and riveted to the centre-line bulkhead. It is considered advisable to divide the pontoon length into at least five watertight compartments, the forward or collision bulkhead being more robust than the others. Fig. 6 shows a useful type of punch and die used for making lightness holes. The planing bottom stiffeners and side stiffeners are continuous fore and aft, and all rivets to the skin are made countersunk as shown in Fig. 7, to minimise resistance. The thicknesses of material required for a machine of approximately 3,000 lb. weight would be :—

Centre line bulkhead	0·040
Centre line bulkhead stiffeners	0·028
Frames and bulkheads	0·040—0·051
Bulkhead stiffeners	0·028
Planing bottom stiffeners	0·040
Side stiffeners	0·040
Chine angle	0·051
Side skin	0·040
Deck plating	0·032
Planing bottom forward	0·051
Planing bottom aft	0·040

Fig. 3 shows a sketch front view of a biplane racer in which the horizontal member between the floats is a streamline tie-rod and Fig. 4 indicates details of the attachment of same inside the float.

On the planing bottom the average stiffener spacing is 6 in. and on the sides 8 in., where **Z** or bulb angle stiffeners are used, these stiffeners having half-inch or five-eighths inch flange to skin.

The following table of riveting gives good results in practice :

Thickness of Plate.	Diameter of Rivet. In.
0·020—0·028	$\frac{3}{32}$
0·032—0·049	$\frac{1}{8}$
0·051—0·065	$\frac{5}{32}$
0·08 —0·128	$\frac{3}{16}$

Laps.

Thickness.	S.R. Laps. In.	D.R. Laps. In.	T.R. Laps. In.
0·032–0·049	$\frac{5}{8}$	1	$1\frac{3}{8}$
0·051–0·065	$\frac{3}{4}$	$1\frac{1}{8}$	$1\frac{5}{8}$
0·08 –0·128	$\frac{3}{4}$	$1\frac{3}{8}$	2

Butt Straps.

Thickness.	S.R. Strap. In.	D.R. Strap. In.	T.R. Strap. In.
0·032–0·049	$1\frac{1}{8}$	$1\frac{7}{8}$	$2\frac{5}{8}$
0·051–0·065	$1\frac{3}{8}$	$2\frac{5}{16}$	$3\frac{1}{4}$
0·08 –0·128	$1\frac{5}{8}$	$2\frac{3}{4}$	$3\frac{7}{8}$

Chassis

To ensure safety it is recommended that the chassis should be stressed for the following cases :—

Condition 1

Landing on water with no angle of bank in such an attitude that the resultant water reaction acts at a point on the line joining the nose of float with the bottom of the step, and distant one-third of the length of the line from the nose—the reaction being inclined backward from the normal to this line at an angle tangent—$1\frac{1}{3}$. The resultant couple to be balanced by the inertia of the machine.

Factor required—7·5 (on weight of machine).

Condition 2

The machine at rest on the water with no angle of bank and inclined so that the main planes are at their stalling angle.

Factor required—6 (on weight of machine less floats).

Condition 3

Machine rolling—weight of machine acting through C.G. of machine and C.B. of one float.

Factor required—2 (on weight of machine.)

Condition 4

C.P.F. Flight—Flying wire loads.

Factor required—9.

Condition 5

C.P.A. Flight—Flying wire loads.

Factor required—7.

Condition 6

Side load on each float equal to—weight of machine less weight of floats—divided by number of floats, and applied at a point in the plane of the top surface of the float vertically above the float C.B.

Factor required—10.

IN THE DRAWING OFFICE.

THAT PULLEY PROBLEM

By R. RODGER.

In an article entitled " On Angles " appearing in THE AIRCRAFT ENGINEER, dated May 30, 1930, Mr. H. Parkinson defined an analytical solution to a pulley bracket problem involving a compound angle. Mr. Parkinson's conclusions were criticised in August 29 issue of THE AIRCRAFT ENGINEER by Mr. E. H. Atkin, the controversy apparently being as to which angles were actually required for the layout of the bracket.

But why worry ? The problem is essentially one for the Drawing Office and is, therefore, due for solution by a draughtsman. In arriving at that solution the draughtsman will surely practise his art—the art of projection and development of surfaces—and eliminate the possibility of masked errors. As Mr. Atkin points out, it is a comparatively easy matter in analysis to assess the axes of reference incorrectly even when the angles themselves are known.

Conjuring on a " guessing stick " with trigonometrical ratios may undoubtedly supply us with the correct numerical values of certain required angles, but I'll warrant that nine draughtsmen in every ten would prefer to see " the cards on the table." Besides, chief and assistant designers are sometimes awkward people to deal with, and have a nasty habit of wanting to know why at inopportune moments. The draughtsman might endeavour to answer the query by wading through the analytical proof, but I doubt if the resulting assemblage of hieroglyphics would be very convincing to the chief.

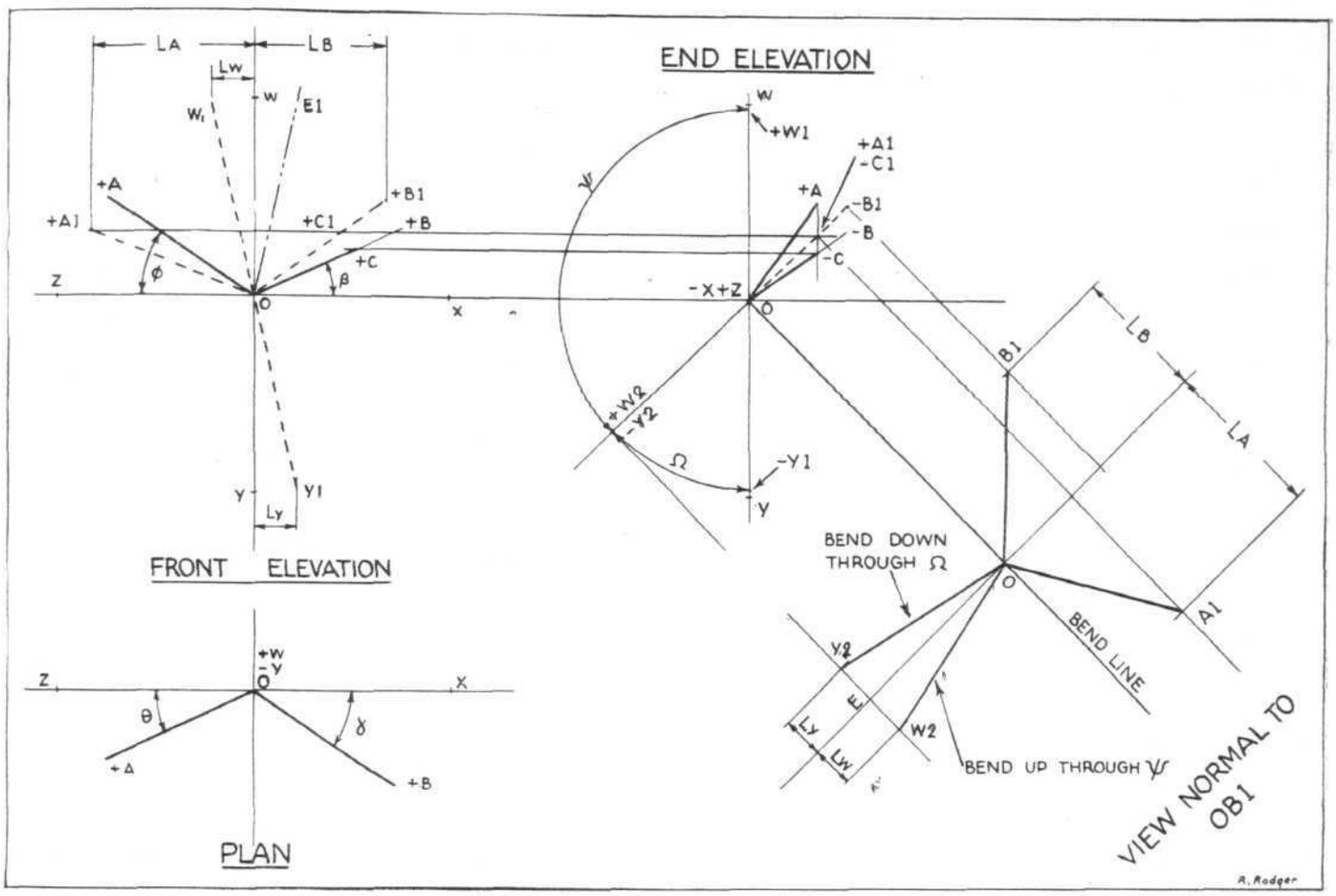
In any case, the graphical solution is so delightfully straightforward, forms a record wherein one can *see* every step and its consequences, and, finally, produces a result—a finished drawing—which can be issued directly to the shops for immediate use.

Having, I hope, justified graphics to the detriment of analysis, I submit below an idea of how " the man on the board " would, or rather should, reduce this awkward pulley problem to cold facts in the plane of the paper.

In the diagram the front elevation and plan are set out from the known apparent angles ϕ, β, θ and γ, the end elevation being a derivative of the other two views.

Subsequent operations and ready reference in a problem of this kind are considerably simplified if an elementary form of notation be employed. Thus, all points of reference in their original positions are indicated by a letter, A, B, C, etc. Each subsequent position is indicated by a numeral following the letter, as A1, A2, A3, etc., whilst additionally each operation should be indicated by a distinctive colour. Thus, in the original position all lines might be black, in the second position red, in the third position green, and so on. Finally, all reference points which lie *above*. the plane of the paper are indicated by a *plus sign*, and all points *below* the plane of the paper by a *minus sign*. Points in the plane of the paper are given no sign at all.

These last remarks may at first appear to be a little superfluous, but they are prompted by the fact that I have often been amused by the antics of some draughtsmen, confronted by a maze of lines all in one colour and devoid of notation, squinting down a piece of bent wire in an effort to discover what is happening to their lines when they swing a system from one position to another. This practice is to be discouraged as the observer's eye and the piece of bent wire



held in the fingers are *both* mobile relative to each other, and practically any desired result may be attained whereas only one is correct.

A preliminary consideration of the problem leads us to the conclusion that the fundamental data required is the relation of the plane WXYZ, which is the face of a structural member to which the pulley bracket is to be bolted, and the common plane of the cables OA and OB. Plane WXYZ is already in the plane of the paper in the front elevation and normal thereto in the remaining two views. By rotating the front elevation about the centre O in an anticlockwise direction, the two cables can be brought into alignment in the end elevation, whilst still preserving the plane WXYZ normal to the plane of the paper in that view.

To accomplish this, project A on to OB at C in end elevation. Again, project this intersection point C across on to OB in front elevation. Place a piece of tracing paper over the front elevation and pivot the paper at O. Plot points A and C on this overlay and then, by trial and error, line these two points up with the axis XZ. This operation takes but a few seconds. Prick through points A and C in their new positions, remove overlay, and set in the new positions of the cables OA1 and OB1 as indicated by the dotted lines. Project A1 (front elevation) on to line AC (end elevation) and through intersection point A1 draw dotted line OA1B1.

We now have in the end elevation two required planes both normal to the plane of the paper. This is half the battle.

The next step is to throw a view normal to the plane OB1 (end elevation). This gives the true run of the cables.

In front elevation, swing axis WY to W1Y1 so that angle WOW1 equals angle AOA1. Project W1 and Y1 on to WY (end elevation). Swing OW1 and OY1 into plane OB1 (end elevation), extended, through angles ψ and Ω, respectively, giving OW2 and OY2, and project normal to plane. This gives us the developed centre lines about which the fixing bolts are pitched, OW2 for the upper plate and OY2 for the lower.

The projection of the origin O gives the bend line.

We now have five lines about which the cheek plates of the bracket and the pulley guard can be finally detailed ready for issue to the sheet metal workers.

The developed centre lines, OW2 and OY2, are only required when there is a restricted landing for the fixing bolts, *e.g.*, when the bracket is attached to a strut or like member where the bolts have to pass through or adjacent to the neutral axis of the cross section. In other cases where there is room to turn the bracket on the face of the structural member, these offset centre lines may be dispensed with, the line OE will become the centre line for pitching the fixing bolts, and common cheek plates may be used with different bend angles ψ and Ω, which is, of course, an advantage from the point of view of manufacture. Such a bracket will have to be skew-set on the face of the structural member to the angle WOW1 (front elevation) to give alignment to the cables and pulley rim, the setting being in a *clockwise*, direction. Thus, after bending, the centre line OE will appear at OE1 (front elevation), angle WOE1 being equal to angle WOW1.

TECHNICAL LITERATURE

SUMMARIES OF AERONAUTICAL RESEARCH COMMITTEE REPORTS

These Reports are published by His Majesty's Stationery Office, London, and may be purchased directly from H.M. Stationery Office at the following addresses: Adastral House, Kingsway, W.C.2; 120, George Street, Edinburgh; York Street, Manchester; 1, St. Andrew's Crescent, Cardiff; 15, Donegall Square West, Belfast; or through any bookseller.

THE EQUATIONS OF MOTION OF A VISCOUS FLUID IN TENSOR NOTATION. By C. N. H. Lock, M.A. R. & M. No. 1290. (Ae. 439) (28 pages.) April, 1929. Price 1*s.* 6*d.* net.

In all physical problems of a general nature, and in hydrodynamics in particular, a considerable simplification arises if the various "vector" quantities are represented by a single symbol instead of the three components of the vector in Cartesian co-ordinates. The result of doing so is to ensure that none but vector expressions occur in the equations; on the other hand,

the vector expressions (such as the vector product, divergence, curl, etc.) have to be manipulated by apparently arbitrary rules, many of which must be proved by returning to the Cartesian notation. The "Tensor" notation, on the other hand, has the advantage that it makes use of none but the ordinary rules of algebra and the calculus, and while dealing with the actual components of vectors it is possible by use of suitable notation and by a special convention to obtain the same economy in the use of symbols with the ordinary vector notation.

In the present report the various steps in the standard proof of the equations of viscous flow are translated into tensor forms. The resulting equations apply to the most general possible system of co-ordinates in three dimensions in which the three co-ordinates are arbitrary functions of the Cartesian co-ordinates. The co-ordinates are therefore in general, curvilinear and oblique. The tensor equations are here used to obtain the equation of viscous flow and expressions for the components of stress in general orthogonal curvilinear co-ordinates in ordinary notation. These can at once be reduced to the commonly useful forms of spherical polars, ellipsoidal co-ordinates, etc. In a final section of the report it is shown how the tensor equations can be used to deduce the equation of viscous flow in terms of Stoke's stream function for motion symmetrical about an axis in orthogonal co-ordinates.

THE STRESSES IN A RADIALLY-SPOKED WIRE WHEEL UNDER LOADS APPLIED TO THE RIM. By Prof. A. J. Sutton Pippard, M.B.E., D.Sc., M.Inst.C.E., and W. E. Francis, M.Sc. R. & M. No. 1302. (Ae. 445.) (43 pages and 17 diagrams.) February, 1930. Price 2*s*. 3*d*. net.

In a wheel of the artillery type the spokes consist of stout members rigidly attached both to the hub and to the rim. Under the action of loads applied to the rim these spokes are subjected to direct forces, either tensile or compressive, to transverse shearing forces and to bending moments: the resultant actions at any section of the rim consist of a bending moment, a radial shearing force and a tangential tension or compression. An analysis of the stresses in such a wheel has already been given.*

In another type, known as the wire wheel, commonly used for motor cars and aeroplanes, the stout spokes of the artillery wheel are replaced by light wire members which are given initial tensions to enable them to resist compressive forces. The number of spokes is large, ranging from 32 in a bicycle-wheel to as many as 168 in a large car or aeroplane wheel.

The arrangement of the spokes varies in different makes of wheel. For the purpose of analysis, it may be assumed that all can be reduced to the case of a single system of radial spokes supporting the rim at a number of equidistant points. Such a wheel is theoretically incapable of resisting loads on the rim except those acting radially, a slight rotation of the rim relative to the hub being required before tangential loads can be taken.

Therefore, in the theoretical and experimental analysis which follows, the case considered is that of a wheel with radial spokes under the action of a radial load on the rim. The practical application of the results obtained is left for discussion in a further paper. Since the spokes have practically no flexural rigidity they are, in effect, pin-jointed both to the hub and to the rim, and this is here assumed.

By the methods of strain energy analysis a complete solution of the problem of stress distribution in a radially spoked, radially loaded wire wheel is obtained. This solution, however, when the number of spokes exceeds six, is not by itself of great practical value, since the degree of accuracy required in arithmetical work renders it very long and tedious in use. Sufficient experimental work has been done, however, to justify the use of approximate formulæ based on a mathematical analysis of the case of a wheel having an infinite number of spokes.

* "On the stresses in a spoked wheel under loads applied to the rim."—A. J. S. Pippard and J. F. Baker. *Phil. Mag.*, Vol. II, Dec. 1916, pp. 1234-1253.

LATERAL STABILITY CALCULATIONS FOR THE BRISTOL FIGHTER AEROPLANE. By A. S. Halliday, B.Sc., Ph.D., D.I.C. and C. H. Burge. R. & M. No. 1306. (Ae. 446.) (13 pages and 17 diagrams.) February, 1930. Price 1*s*. net.

The object of the present investigation is to develop from the usual equations of motion the subsequent lateral movements of an aeroplane (Bristol Fighter) following an initial disturbance or a sudden application of either ailerons or rudder.

The calculations are made for the aeroplane in gliding flight for a range of angle of incidence from 0 deg. to 24 deg. by intervals of 4 deg. Sufficiently reliable information was not available to warrant the calculations being carried out for angles of incidence greater than 24 deg. The control calculations assume a rudder angle of 20 deg. and an aileron angle of 10 deg. For each of the various disturbances the resulting motion of the machine has been plotted for a period of time of 5 sec.

The machine is found to be stable throughout the range of incidence except for angles of incidence of 16 deg. and 24 deg. and also at 20 deg., when the continuous rotation value of Np is used in place of the one derived from the oscillation method, the machine is then very unstable at this angle.

A MICROMANOMETER OF HIGH SENSITIVITY. By E. Ower, B.Sc., A.C.G.I. R. & M. No. 1308. (Ae. 448.) (7 pages and 4 diagrams.) February, 1930. Price 9*d*. net.

A manometer of sensitivity exceeding that of any convenient existing type was required for the extension to low wind speeds of the calibration of the National Physical Laboratory standard pitot-static tube.

Rough experiments indicated that a sensitivity of 0·00001 in. of water could be obtained with a null-reading instrument embodying the Chattock tilting cup principle and using the movement of a small air bubble in a horizontal capillary tube to indicate balance of pressure in the cups.

An instrument has been constructed on these lines. With the precautions taken to ensure steady temperature conditions and to avoid the necessity for more than normally good workmanship in the mechanical construction, the behaviour of the instrument is entirely satisfactory. It indicates pressure differences of 0·000005 in. of water, and is thus more than ten times as sensitive as a 13-in. Chattock gauge. With its aid a velocity head corresponding to a speed of 1·5 ft. per second can be observed with an error not exceeding ± 1 per cent. on speed.

The instrument will first be used for calibrating the standard pitot-static tube at low speeds.

A detailed descr iption of the manometer is given in an Appendix.

WIND TUNNEL TESTS ON GLOSTER AND SUPERMARINE WING RADIATORS. By R. G. Harris, M.A., D.Sc., F.R.S.E., L. E. Caygill, B.Sc., A.M.I.M.E., and R. A. Fairthorne. Presented by the Director of Scientific Research, Air Ministry. R. & M. No. 1311. (Ae. 450.) (14 pages and 7 diagrams.) June, 1927. Price 9*d*. net.

Honeycomb radiators are inefficient for high speed work on account of their drag, and the properties of wing radiators have been investigated, since the use of the latter should reduce or eliminate radiator drag, according to design.

Heat dissipation was measured on the corrugated Gloster radiator and on a smooth Supermarine radiator at wind speeds ranging from 40 ft./sec. to 130 ft./sec. Other questions investigated on the Supermarine were distribution of heat dissipation between upper and lower surfaces, and the effect of painting the surface. Drag was measured on the Gloster radiator from — 2·5 to 3·0° and sufficient pressure plotting was done to establish the lift curve for this aerofoil.

Heat dissipation per unit cooling area, added drag per horse-power dissipated, weight per horse-power dissipated and equivalent drag horse-power per horse-power dissipated, at 400 ft./sec. were measured. The Gloster radiator can deal with about 19 per cent. more heat than the Supermarine, its corrugations adding 44 per cent. to the cooling area; but the radiator increases the drag of that part of the wing to which it is fitted by 24 per cent.

THE STABILITY OF A BODY TOWED BY A LIGHT WIRE. By H. Glauert, M.A. Presented by the Director of Scientific Research, Air Ministry. R. & M. No. 1312. (Ae. 451.) (22 pages and 4 diagrams.) February, 1930. Price 1*s*. 3*d*. net.

The form assumed by a light wire, which is used to tow a body behind an aeroplane at a constant speed, has been known for many years, and in report R. & M. 554, A. R. McLeod* has derived the corresponding form for a heavy wire. No attempt, however, appears to have been made to determine the stability of the body, and this problem is becoming important owing to the practice of towing aerodynamic instruments below an aeroplane.

The stability of a body (*e.g.*, an instrument) towed by a light inextensible wire has been investigated on certain simplifying assumptions regarding the force experienced by the wire. In addition to the pitching and yawing oscillations of the body there are three oscillations of the whole system. The most important oscillation is associated with a bowing of the wire in the plane of symmetry, and, even if the body has satisfactory statical stability, this oscillation may become unstable if the body is too short or if the drag of the body is low compared with that of the wire.

Further investigation is necessary to examine the dynamical effects on the wire which are ignored in the present analysis.

* R. & M. 554. "On the action of wind on flexible cables, with application to cables towed below aeroplanes, and balloon cables." (1918.)—A. R. McLeod.

CHARTS FOR AIRCRAFT PERFORMANCE REDUCTIONS. By H. L. Stevens, B.A., and A. E. Woodward Nutt, B.A. Presented by the Director of Scientific Research, Air Ministry. R. & M. No. 1316. (Ae. 453.) (18 pages and 3 diagrams.) April, 1930. Price 1*s*. net.

The object of this report is to present a series of charts, by the use of which the performance of an aircraft under standard conditions can rapidly and accurately be obtained from the test observations. It is thought that by the use of these charts a saving of time over that used in existing methods may be effected, and that owing to the elimination of a certain amount of arithmetical calculation increased accuracy may be obtained. The charts show whether the observations should be reduced on the pressure, density, or some intermediate basis, and enable the correct basis of reduction to be applied. Alternatively, if standard performance curves have been obtained for any particular aircraft, the charts enable the effect of a change in the basis of reduction to be seen. They also cover the use of either I.C.A.N. or isothermal altimeters.

The general principle of the method of reducing the observations and the manner in which the charts are used for establishing the basis of reduction and for applying it when found is described. The theoretical argument underlying the method of reduction and the derivation of the charts is given later. Condensed tabular statements of the operations necessary to obtain any specific standard performance curve and a numerical example are given in the Appendices.

To take full advantage of the method the observations in any particular case should be plotted on copies of the appropriate charts. A large number of copies of the two essential charts are being made and will be supplied to testing establishments to facilitate reduction work

FLIGHT TESTS ON THE VARIATION OF THE RANGE OF AN AIRCRAFT WITH SPEED AND HEIGHT. By Flight-Lieut. C. E. Maitland, D.F.C., B.A., R.A.F., and A. E. Woodward Nutt, B.A. Presented by Director of Scientific Research, Air Ministry, with an Appendix by H. T. Tizard, C.B., F.R.S. R. & M. No. 1317 (Ae. 454). (7 pages and 10 diagrams). June, 1929. Price 9*d*. net.

As a result of discussions by the Range of Aircraft Panel it has become evident that the aerodynamic side of the problem of the range of an aeroplane was well understood but that very little experimental evidence was available as to the specific fuel consumption of engines. The Panel came to the conclusion that an observed considerable increase of maximum range which occurred with height should be accepted with reserve, and requested that further flight tests should be carried out. The tests described in this report were made with the object of obtaining direct evidence on this matter.

The petrol consumption of a Vickers Venture aircraft was measured at a series of level speeds at four different heights, with the maximum amount of

altitude control obtainable at each speed without a fall of revolutions per minute, and also with a rather weaker mixture. Curves of range against indicated air speed for each height are drawn. Full throttle partial climbs at four heights were also made to find the power factor for the engine, and a few consumption measurements made during these flights.

A definite increase in the range of the aircraft at all speeds occurs with increase of height when the maximum amount of altitude control possible without a fall in revolutions per minute is used. It appears, however, that a large part of the loss of range at low altitudes can be regained if mixtures weaker than those implied by the above amount of altitude control can be used without fear of damage ensuing to the engine. The fuel consumption is extremely sensitive to the position of the altitude control, and considerable practice is required before a pilot can obtain consistent repeat readings of consumption when using the maximum amount of altitude control possible without a fall in revolutions per minute. For future consumption tests it is considered that a flowmeter visible by the pilot should be fitted.

The appendix points out that the experimental results of this report are contrary to what would be expected on theoretical grounds if maximum fuel economy was obtained under all conditions. The discrepancy, which is considerable appears to be due mainly to the insufficient use of altitude control, and to the absence of means of varying the ignition timing.

DETONATION AND LUBRICATING OIL. By R. O. King, M.Sc., and H. Moss, D.Sc. Presented by the Director of Scientific Research, Air Ministry. R. & M. No. 1318 (E. 35). (23 pages and 3 diagrams). January, 1930. Price 1*s.* 3*d.* net.

The work on dopes and detonation begun at the Air Ministry Laboratory in 1924 included a determination of the effect on detonation of many common organic substances, including mineral oil, when added to the fuel of an internal combustion engine. The results obtained for substances of known composition only were given in the published report,* and those for lubricating oil were thus excluded. In these early experiments, no measurable effect on detonation was observed on the addition to the fuel of as much as 5 per cent. of its volume of B.B. mineral lubricating oil. The fuel was a petrol with small aromatic content and the experiments were made at an engine speed of 1,500 r.p.m. It has been found since that in these circumstances an easily measurable effect on detonation is not to be expected. In later experiments it appeared that colloidal iron, nickel and lead were all effective in delaying detonation but that colloidal gold procured from the oleate of the metal had the opposite effect. It was suggested that this adverse effect might be due to oleic acid derived from the gold oleate, and while carrying out further work to elucidate the cause of detonation‡ it was found that a lubricant such as olein or oleic acid when added to a fuel containing metallic dope had the effect of partially inhibiting the detonation delaying action of the dope. The effect was much more marked with iron than with lead dope and oleic acid, which is a well-known catalyst poison, was more effective than other oils in neutralising the beneficial effect of metallic dope.

The experimental work described in this report was undertaken to ascertain the effect of lubricating oil on the tendency to detonation of liquid fuels. The effect of typical lubricating oils on fuels containing benzole or metallic dope has been determined for oils in solution in the fuels in proportions up to 12 per cent. of the oil-fuel mixture.

The beneficial effect of the iron and nickel carbonyls with respect to detonation is almost completely destroyed when the fuel contains as much as 12 per cent. of dissolved lubricating oil of any sort. When the fuel contains smaller proportions of oil, the deleterious effect varies with the nature of the oil, mineral oil having least and oleic acid most effect.

* Callendar, King and Sims, R. & M. 1013.
† Sims and Mardles, R. & M. 1021.
‡ Callendar, King, Mardles, Stern and Fowler, R. & M. 1062.

MOMENTS AND FORCES ON A YAWED MODEL AEROPLANE. By W. G. A. Perring, R.N.C., and C. Callen. Presented by the Director of Scientific Research, Air Ministry. R. & M. No. 1319. (Ae. 445.) (3 pages and 3 diagrams.) February, 1930. Price 4*d.* net.

In previous experiments the forces and moments on yawed model aeroplanes have only been measured for angles of yaw up to 45°. Longitudinal and cross wind forces and rolling and yawing moments have been measured on a model aeroplane fitted with R.A.F.14 wings. The model was tested at an angle of incidence of 12·6° and zero roll angle for angles of yaw varying from 0° to 90° to the wind direction. The values of the rolling moments have also been determined over the same range of yaw angle for ± 5° roll angle. All the results have been referred to body axes.

CONTROLLABILITY AT LOW SPEEDS AND FULL-SCALE MEASUREMENT OF LIFT AND DRAG OF PARNALL "PETO" FITTED WITH R.A.F. 15 AND R.A.F. 31 SECTION WINGS (SLOTTED AND UNSLOTTED). By R. K. Cushing. Presented by the Director of Scientific Research, Air Ministry. R. & M. No. 1320 (Ae. 456). (11 pages and 10 diagrams.) January, 1930. Price 9*d.* net.

During performance trials of the Parnall "Peto" at M.A.E.E., in February, 1929, different sets of wings were fitted, the object of the tests being to find out the most efficient set of wings which would at the same time give adequate lateral control at the stall. In addition to the ordinary performance measurements, lift and drag were measured over a range of incidences up to stalling incidence and observations were taken of the behaviour of the aircraft near the stall.

The R.A.F. 31 section wings with slotted square wing tips gave the maximum value of $k_L = 0·635$, while the R.A.F.15 section unslotted wings gave the lowest value of k_L = max. 0·508.

The unslotted wings with round wing tips were found to possess vicious qualities when the stalling point was reached. With the slotted wings and with the R.A.F.31 section unslotted wings with square wing tips there was a marked improvement in control at the stall.

It is considered that the maximum lift coefficients obtained with the wings are about normal for the wing arrangement, which is somewhat unusual. For the tests of controllability, the R.A.F.31 section wings with square slotted wing tips gave the best results. The most interesting fact brought out by the tests was the improvement in the behaviour of the R.A.F.31 section wings near the stall caused by squaring the wing tips.

MAXIMUM LIFT COEFFICIENT OF R.A.F. 30 ALL-MOVING RUDDER. By F. B. Bradfield, Math. & Nat. Sci. Triposes. R. & M. No. 1321. (Ae. 458.) (4 pages and 4 diagrams.) February, 1930. Price 4*d.* net.

Lift was measured up to the stall on an all-moving rudder (R.A.F. 30 section) of aspect ratios 1·5 and 3·0, both alone and as part of a biplane tail. The wings and fuselage were not represented.

A R.A.F. 30 rudder at R = 0·25 × 106 shows a large increase of k_L maximum when placed between biplane tailplanes. Tests of a cambered aerofoil between end plates made at Göttingen suggest that this large increase is not general.

A STUDY OF POLYNOMIAL EQUATIONS. By W. L. Cowley and Sylvia W. Skan. R. & M. No. 1325 (Ae. 459). (20 pages and 2 Tables.) February, 1930. Price 1*s.* net.

For the purposes of a complete investigation of problems in aeroplane stability it is essential to have a method for the solution of polynomial equations, which can be applied to equations of very high order, which will present no cases of failure, and which will permit a convenient study of the effects of changes in design.

A method is developed for the solution of equations by starting from the zero root, which occurs when the last term K is made equal to zero. Formulæ are derived from the effect on the root of a small change in K, and the root of the given equation is obtained by a step integration of such small changes until K assumes the value required.

Other methods for the solution of high order equations are discussed. Cases are indicated in which one of these methods may be used with advantage, but they tend in general to become very laborious or complicated as the order of the equation is increased, they are liable to fail in certain cases, and they cannot be extended to a study of the effects of changes in design. It is claimed for the present method that it is extremely accurate and does not become unwieldy even for very high order equations. No cases of failure arise and it can also be easily extended to various problems.

WIND TUNNEL EXPERIMENTS ON STEAM CONDENSING RADIATORS. By R. G. Harris, M.A., D.Sc., F.R.S.E., L. E. Caygill, B.Sc., and R. A. Fairthorne. Presented by the Director of Scientific Research, Air Ministry. R. & M. No. 1326 (E. 37). (28 pages and 17 diagrams.) June, 1930. Price 1*s.* 6*d.* net.

The present research is a further development of the radiator experiments which have been carried out in the R.A.E. since 1922. In the report of 1924 experiments* on honeycomb radiators, it was suggested that the properties of wing radiators should be investigated. In 1925 steam cooling was tested on honeycomb radiators (Part I of this report), and during 1927 tests of water cooling were made on two wing radiators,† in connection with the competition for the Schneider trophy. In 1928 (Part II of this report) steam cooling was applied to an experimental wing radiator forming the nose of an aerofoil, to a design submitted by Wing-Commander T. R. Cave-Brown-Cave.

The following general conclusions were reached :—(*a*) Honeycomb radiators, Steam cooling decreased the heat dissipation about 4 per cent. at 60 m.p.h. and the weight 37 per cent. for the above tubes (*i.e.*, weight per horse-power. 34 per cent.) and would, therefore, improve the performance under conditions where weight is important.

(*b*) Wing radiator. By using the most efficient portion of the wing, a high heat dissipation has been obtained, the cooling per unit surface being about 60 per cent. greater than that of a wing radiator occupying the whole surface. The radiator was satisfactory in use and gave no trouble in starting; the drainage was satisfactory down to 0° dihedral; the radiator continued to work indefinitely even at a slight negative dihedral, but with reduced efficiency of cooling. This radiator can deal with all the heat dissipation required on the Bristol Fighter and Fairey Fox, chosen as examples.

A wing condenser is being tested in flight on a Bristol Fighter.

* R. & M. 952. Further experiments on honeycomb radiators.—Harris and Caygill, A.R.C. 1924–25, p. 438.
† R. & M. 1311. Wind tunnel tests on Gloster and Supermarine wing radiator. Harris, Caygill and Fairthorne.

WIND TUNNEL TESTS OF SEVEN STRUTS. By A. S. Hartshorn, B.Sc. Presented by the Director of Scientific Research, Air Ministry. R. & M. No. 1327. (Ae. 460.) (12 pages and 6 diagrams.) November, 1927. Price 9*d.* net.

For the guidance of the British Engineering Standards Association in standardising the manufacture of steel tube struts, seven sections were tested in the No. 2 seven-foot tunnel of the R.A.E. during August and October, 1927.

Three streamline and three elliptical sections of fineness ratios 2·0, 2·5, and 3·0, and one special strut of fineness ratio 3·03, each having a major axis of 5 in., were tested for drag over a speed range from 60 to 120 ft./sec. The effect of yaw on drag and cross wind force was measured at 60 ft./sec.

The streamline struts of fineness ratio 3·0 and 3·03 give the lowest drag per unit of frontal area and the absolute drag per sq. ft. frontal area for a long strut is considered to be approximately 0·8 lb. at 100 ft./sec. The elliptical struts had a high drag, particularly at the smaller Reynolds numbers in the range tested.

MAXIMUM FORCE ON RUDDERS. By F. B. Bradfield, Math. and Nat. Sci. Triposes. Presented by the Director of Scientific Research, Air Ministry. R. & M. No. 1329 (Ae. 461). (4 pages and 12 diagrams.) April, 1930. Price 6*d.* net.

In view of the growing use of all-moving rudders, it has become necessary to review the airworthiness requirements for rudder strength. As a step towards this object, model tests from which the lift coefficient of various rudders may be deduced have been collected, and a table is appended showing the outline of each rudder, and giving sufficient data (wherever these are available) to reconstruct its lift curve.

The results have been collected into the following classes :—(1) monoplane tail, rudder behind fin, (2) monoplane tail, all-moving rudder, (3) biplane tail,

rudder behind fin, (4) biplane tail, all-moving rudder, (5) all-moving rudder tested alone.

k_L max. for a fin and rudder (calculated on the total area) will be in the neighbourhood of 0·35 for zero yaw, unless seriously shielded, when it will be less. A value of 0·6 may be reached when yawed. For an all-moving rudder free from shielding, k_L max. may be as high as 0·6, but in general will be less on account of the body screening. Between tailplanes, at least as high a value may be expected.

MAXIMUM FORCE ON THE FIN AND RUDDER OF A BRISTOL FIGHTER. By F. B. Bradfield, Math. and Nat. Sci. Triposes and R. A. Fairthorne. Communicated by the Director of Scientific Research, Air Ministry. R. & M. No. 1330 (Ae. 462). (4 pages and 4 diagrams.) May, 1930. Price 4*d*. net.

To find the maximum normal force on a fin and rudder when the aircraft is yawed, yawing moments were measured on a Bristol Fighter model, with the standard rudder and with the "R.A.E. large" rudder, the rudders being set at large angles and the model yawed. Yawing moments without fin and rudder were measured, the normal force on the fin and rudder deduced.

It was found that at 9° wing incidence, the normal force coefficient for the standard rudder increases from 0·29 at 0° yaw to 0·61 at 25° yaw with 30° rudder angle. With the large rudder the corresponding figures are: 0·35 at 0° yaw to 0·58 at 30° yaw with 25° rudder angle.

HINGE MOMENTS OF BALANCED AND UNBALANCED AILERONS ON R.A.F. 14 WING, TO LARGE ANGLES OF INCIDENCE. By F. B. Bradfield, Math. and Nat. Sci. Triposes, and R. A. Fairthorne. Communicated by the Director of Scientific Research, Air Ministry. R. & M. No. 1331 (Ae. 463). (9 pages and 8 diagrams.) May, 1930. Price 9*d*. net.

With a view to extending the range of hinge moment measurements on ailerons to large incidences and to large negative aileron angles, such as might be used with differential gearing and in a spin, hinge moments were measured on an aileron on a R.A.F.14 section monoplane wing, at (*a*) unbalanced, (*b*) hinge set back 30 per cent., symmetrical nose, pointed and round, (*c*) balance plane of Avro type, but below the wing, various positions.

From the results obtained it was found that the set back hinge provides balance up to large angles of incidence of the wing, but when nearly balanced, the hinge moment curves are of erratic shape at 30° and 40° incidence. The round-nosed aileron has more balance than the sharp-nosed one from 0° to 20° incidence.

The Avro type balance plane provides an efficient balance only for small aileron angles and small angles of incidence. It has little effect at large angles.

SUMMARIES OF AMERICAN N.A.C.A. REPORTS

Two Types of Report are issued by the American National Advisory Committee for Aeronautics :—one in mimeographed form, is known as *Technical Notes*, and is not available to the general public. The other is known as *Technical Reports*, and copies can be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. To the prices given below should, of course, be added a certain amount for postage. Below we give brief summaries of some recent *Technical Reports*.

REPORT NO. 333: FULL-SCALE TURNING CHARACTERISTICS OF THE U.S.S. "LOS ANGELES." By F. L. Thompson. Price 10 cents.

This paper presents a description of the method employed and results obtained in full-scale turning trials on the rigid airship U.S.S. "Los Angeles." This investigation was requested by the Bureau of Aeronautics, Navy Department, and was carried out in conjunction with pressure distribution and stress investigations. The pressure and turning investigations were conducted by representatives of the National Advisory Committee for Aeronautics and the stress investigation by the Bureau of Aeronautics.

The results of this investigation are not sufficiently comprehensive to permit definite conclusions as to the variation of turning characteristics with changes in speed and rudder angle. They indicate, however, that the turning radius compares favourably with that for other large airships, that the radius is independent of the speed, that the position of the point of zero yaw is nearly independent of the rudder angle and air speed and that a theoretical relation between radius and angle of yaw in a turn gives a close approximation to actuality. The method of determining turning characteristics by recording instruments aboard the airship appears to be satisfactory, with the exception that a better method of determining the small angular velocities of airships should be devised.

REPORT NO. 335: AERODYNAMIC THEORY AND TEST OF STRUT FORMS—PART II. By R. H. Smith. Price 20 cents.

This report, submitted to the National Advisory Committee for Aeronautics for publication, presents the second of two studies under the same title. In this part five theoretical struts are developed from distributed sources and sinks, and constructed for pressure and resistance tests in a wind tunnel. The surface pressures for symmetrical inviscid flow are computed for each strut from theory and compared with those found by experiment. The theoretical and experimental pressures are found to agree quantitatively near the bow, only qualitatively over the suction range, the experimental suctions being uniformly a little low, and not at all near the stern.

This study is the strut sequel to Fuhrmann's research on airship forms, the one being a study in two dimensions, the other in three. A comparison of results indicates that the agreement between theory and experiment is somewhat better for bodies of revolution than for cylinders when both are shaped for slight resistance. The consistent deficiency of the experimental suctions which is found in the case of struts was not found in the case of airships, for which the experimental suctions were sometimes above sometimes below their theoretical values.

Along with these five theoretical struts were made three empirical struts of high repute, the British strut given in Reports and Memoranda No. 183, the German strut No. 53, and the United States Navy No. 2, and all eight tested for total resistance. Of the five theoretical struts, No. 1 excels as a fairing, No. V as a strut. No. V and the United States Navy No. 2 have about equal merit as struts, with the German No. 53 a close second and the British a poor third, the relative merits being 100, 103 and 112, respectively of Reynolds' Number 12 × 10⁴.

REPORT NO. 336: TESTS OF LARGE AIRFOILS IN THE PROPELLER RESEARCH TUNNEL, INCLUDING TWO WITH CORRUGATED SURFACES. By D. H. Wood. Price 10 cents.

This report gives the results of the tests of seven 2 ft. by 12 ft. airfoils (Clark Y, smooth and corrugated, Göttingen 398, N.A.C.A.M-6, and N.A.C.A. 84). The tests were made in the Propeller Research Tunnel of the National Advisory Committee for Aeronautics at Reynolds' Numbers up to 2,000,000. The Clark Y airfoil was tested with three degrees of surface smoothness.

The effect of small variations of smoothness of an airfoil is shown to be negligible. Corrugating the surface causes a flattening of the lift curve at the burble point, and an increase in drag at small flying angles.

REPORT NO. 337: THE GASEOUS EXPLOSIVE REACTION AT CONSTANT PRESSURE—THE REACTION ORDER AND REACTION RATE. By F. W. Stevens. Price 10 cents.

This investigation was carried out at the Bureau of Standards at the request of and with the financial assistance of the National Advisory Committee for Aeronautics.

(1) In the case of the gaseous explosive reaction at constant pressure, the data given in this report show that the statistical expression, $\Gamma = [F]^n{}_y [O_2]^n{}_y$, derived from the order of the stoichiometric equation written for complete combustion of a fuel, is proportional to the spatial rate at which an equilibrium is established in the gaseous explosive system, and that this relation is found to hold for high reaction orders, where very complex hydrocarbon fuels are involved in the transformation.

(2) The above relation, since it is based solely upon the initial and final condition of the transformation, is independent of the microprocesses, whatever these may be, resulting in the final union of the initial active components in the proportions required by the reaction constant K for the temperature and pressure at which the reaction takes place.

(3) The data also provide interesting confirmation of the assumption that high-order reaction processes consist of many simultaneous simpler ones, each running its course within the reaction zone, "according to its own order and mechanism, independently of any other reactions occurring at the same time." The probability of the correctness of this assumption is chiefly shown by the fact that the equivalent reaction order of a composite fuel may be determined from the reaction orders of its components, and further, that the velocity constant, k_F of the fuel may also be determined from the velocity constants of those components.

(4) The data given in this report all cover the "explosive limits" of the fuels investigated. Incidental to the purpose of the investigation here reported, the "explosive limits" will be found to be expressed for the condition of constant pressure in the fundamental terms of concentrations (partial pressures) of fuel and oxygen. It may be seen, from the results given, that a fundamental relation clearly exists between explosive range and the magnitude of $[F]_{max}$ of the fuel.

REPORT NO. 338: THE EFFECT OF REDUCTION GEARING ON PROPELLER-BODY INTERFERENCE AS SHOWN BY FULL-SCALE WIND TUNNEL TESTS. By F. E. Weick. Price 10 cents.

Full-scale tests have been made in the Propeller Research Tunnel of the National Advisory Committee for Aeronautics, on a 10-ft. 5-in. propeller, on a geared J-5 engine, and also on a similar 8-ft. 11-in. propeller on a direct-drive J-5 engine. Each propeller was tested at two different pitch settings, and with a large and a small fuselage. The investigation was made in such a manner that the propeller-body interference factors were isolated, and it was found that, considering this interference only, the geared propellers had an appreciable advantage in propulsive efficiency, partially due to the larger diameter of the propellers with respect to the bodies, and partially because the geared propellers were located farther ahead of the engines and bodies.

REPORT NO. 339: FULL-SCALE WIND TUNNEL TESTS, WITH A SERIES OF PROPELLERS OF DIFFERENT DIAMETERS ON A SINGLE FUSELAGE. By F. E. Weick. Price 15 cents.

Aerodynamic tests were made with four geometrically similar metal propellers of different diameters, on a Wright "Whirlwind" J-5 engine, in an open cockpit fuselage. The tests were made in the Twenty-Foot Propeller Research Tunnel of the National Advisory Committee for Aeronautics. The results show little different in the characteristics of the various propellers, the only one of any importance being an increase of efficiency of the order of 1 per cent. for a 5 per cent. increase of diameter, within the range of the tests.

REPORT NO. 340: FULL-SCALE WIND TUNNEL TESTS ON SEVERAL METAL PROPELLERS HAVING DIFFERENT BLADE FORMS. By F. E. Weick. Price 10 cents.

This report gives the full-scale aerodynamic characteristics of five different aluminium alloy propellers having four different blade forms. They were tested on an open cockpit fuselage with a radial air-cooled engine having conventional cowling, in the Twenty-Foot Propeller Research Tunnel of the National Advisory Committee for Aeronautics, at Langley Field, Va. The results show that (1) the differences in propulsive efficiency due to the differences in blade form were small; (2) the form with the thinnest airfoil sections had the highest efficiency: (3) it is advantageous, as regards propulsive efficiency, for a propeller operating in front of a body, such as a radial engine, to have its pitch reduced toward the hub.

PRIVATE FLYING AND CLUB NEWS

SCOTTISH CLUB SECRETARY.—Sqdn.-Ldr. G. F. Breese, D.S.C., has been appointed secretary to the Scottish Flying Club, the headquarters of which are at Renfrew. Sqdn.-Ldr. Breese was one of the pioneers of flying in this country. He received his first lessons in flying at the Grahame White School, Hendon, and was granted the Aero Club Certificate, No. 1003.

THE BOURNEMOUTH AERO CLUB has already from 30 to 35 members, and the negotiations for acquiring a ground are taking place.

An offer has been received for the provision of hangars, machines, instructors and ground engineers, and the success of the club is assured.

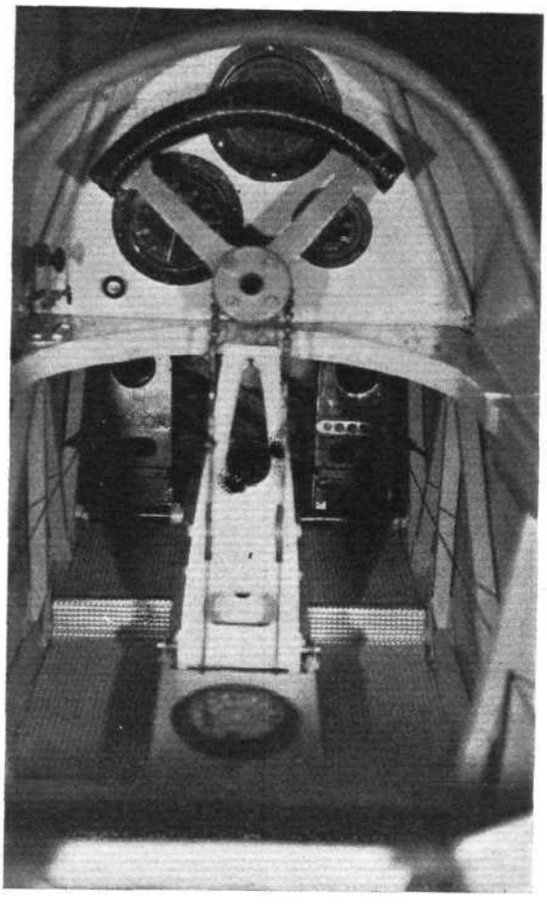
The new club has agreed to co-operate with the Bournemouth Young Airmen's League.

The League is for junior prospective airmen, while the Bournemouth Aero Club aims at enrolling prospective flyers who are over 21 years old.

The chairman of the Bournemouth Aero Club is Mr. J. M. Tomlinson, of Moordown, and the hon. sec., Mr. W. English, of 16, Howard Road, Bournemouth. A provisional committee has been appointed.

Miss Amy Johnson, as president of the Bournemouth Young Airmen's League, has promised to speak at a meeting which is to be held in Bournemouth in November with the object of furthering the club's interests.

The Rt. Hon. F. E. Guest, P.C., D.S.O., who is chairman of National Flying Services, Ltd., has been invited to attend.



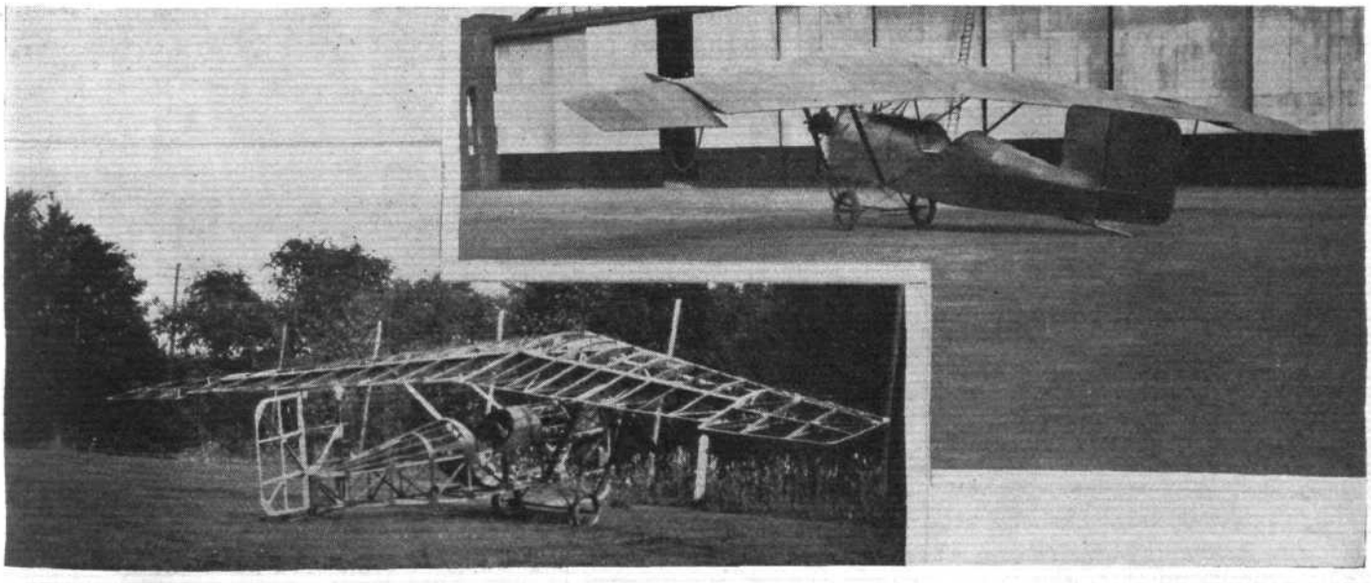
The cockpit of the Archæopteryx.

THIS semi-tailless machine has recently been completed and has made successful flights. Piloted by its designer, it has made test flights of over ½-hr. duration and proved entirely successful. A further and more detailed report will be published at a later date.

CINQUE PORTS FLYING CLUB.—On October 25, Capt. R. A. Shadforth flew G-EBQE to Croydon, to represent the club at the Air Demonstration to the members of the Imperial Conference.

The club sustained a serious loss in the death of Dr. E. D. Whitehead-Reid in the accident at Detling last week. He was one of the original directors of the company, and had been a member since the club's inception. Although not a pilot during the war, he had taught himself to fly immediately after the Armistice, and owned a succession of aircraft, which he kept at Bekesbourne, near Canterbury. He was probably the first practical private owner pilot in this country, and his activities did an enormous amount to encourage private flying. The club was represented at the funeral by Mr. T. A. M. S. Lewis.

THE NORTHAMPTONSHIRE AERO CLUB will be holding their annual ball at the Salon de Danse, Northampton, on Friday, November 7. R. Gubertini and the Savoy Hotel Band will supply the necessary auditory accompaniment. Tickets may be obtained from C. A. Reading, "Braemar," Christchurch Road, Northampton, price 12*s.* 6*d.*, each, including supper. The official notice states that the dance will begin at 9 p.m. and that aeroplanes should be ordered for 2 a.m. This is the first intimation we have had that Sywell aerodrome was lighted for night flying, but possibly it is not so, as, knowing something of the hospitality of the Northampton Club and the verve with which their dances are carried out, it may only be that the 2 a.m. is a misprint for 2 p.m. on Saturday!



Constructional and finished views of the Archæopteryx, which has been built by Messrs. R. F. and I. Granger, at Nottingham.

AIRCRAFT LECTURES AT READING.—The Phillips and Powis School announce that a series of lectures are to be given by Flt. Lt. R. A. Seaton, A.F.R.Ae.S., who, as a Technical Officer in the Royal Air Force, has had considerable experience in lecturing. Three subjects are to be dealt with :—

The Theory of Flight.—This series embraces study of aerodynamic forces, which act on aircraft, and is necessary to the pilot in order that he may have a clear understanding of the behaviour of his aircraft.

Airmanship.—This series deals with care and maintenance of aircraft, and is of practical value to the owner pilot. It also deals with practical flying, *i.e.*, handling the aircraft in the air, and includes a description of component parts of the aircraft.

Navigation and Meteorology.—This series is intended to assist members who contemplate cross-country flights, and includes instruction on the compass, map reading and practical air-pilotage.

There will be six lectures on each subject. The charge for each series will be 2 guineas. Those who are likely to be interested should apply early, as there are only a limited number of seats now available.

It is proposed that the lectures should take place in Reading on Sunday evenings, between 6.30–7.30.

Flt. Lt. Seaton has recently joined the School as an instructor.

Col. L. Strange, a hard working director of the Spartan Aircraft Co., who has been seen at nearly every flying meeting during the past year. (FLIGHT *Photo.*)

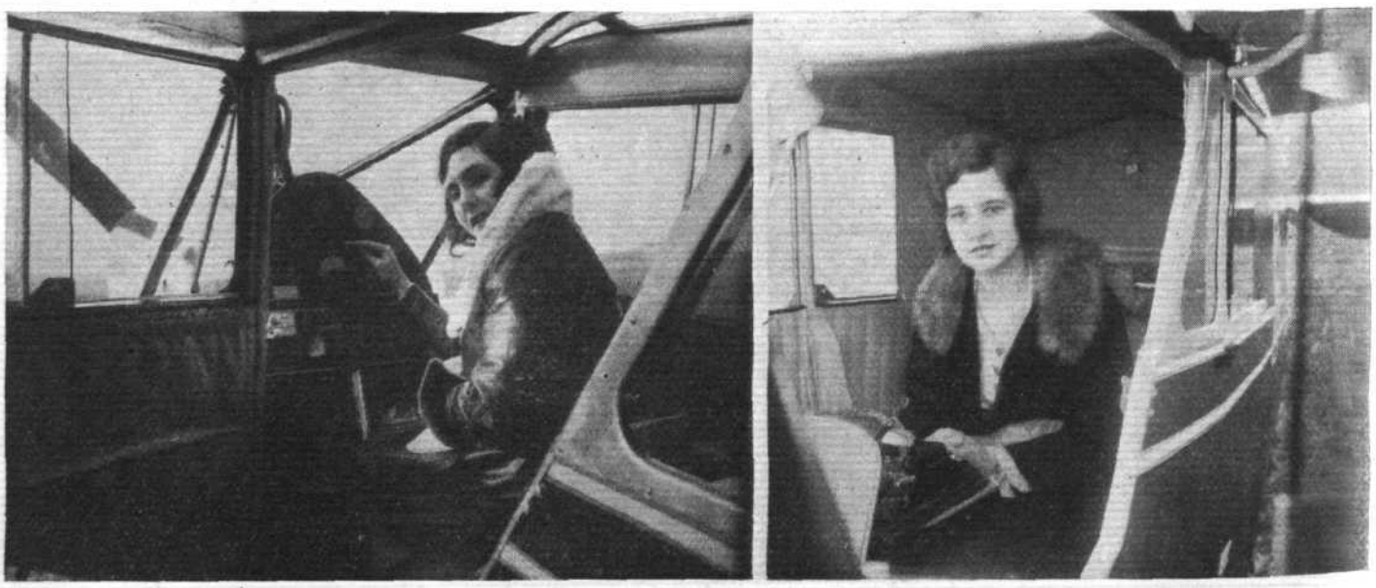
A. A. SERVICE.—Private owners may, if they are forgetful, find themselves in the same plight as Mr. Allen, who is the Aviation Manager for Henly's, and his experience, together with the help he received, should be of interest to possible delinquents.

He writes :—" I feel that the following incident will be of great interest to your readers :—I had occasion to visit Derby on September 17, and landed in a small field adjacent to the Rolls Royce works. Upon landing, a police-constable asked me for my pilot's licence, which I immediately produced. During the course of the afternoon when I was visiting the Rolls Royce Works, the police-constable came down there and said ' I believe you have some form of certificate on your aeroplane, relating to its airworthiness.' I replied that there was, and that I should be pleased to show it to him when I got back to the machine. Unfortunately, on my arrival back, I found that the C. of A. had inadvertently been left at Heston, and I apologised for my omission. Immediately on returning to Heston, I sent particulars of the C. of A. through to the police at Derby, and did not attach any further importance to the matter. However, I received a summons to appear at Derby on the 20th for not being able to produce the C. of A. when called upon to do so by a police-constable. Being a member of the Automobile Association, I got into touch with the Aviation Department, and placed the matter before them, and they said that they would be pleased to conduct my defence for me, saving me the trouble of going to Derby. The justices have dismissed the case on the payment of 4*s.* costs.

This, I believe, is the first occasion on which the A.A. have defended an aviation summons, and I think you will agree that they carried out the work in a most satisfactory manner, which, to my way of thinking, proves the efficiency of their organisation."

SINGAPORE FLYING CLUB.—The general depression in local commodity prices seems to have been reflected in the weather for the months of July and August, and conditions have been so bad that flying times of only 79 hr. 40 min. in July and 105 hr. 15 min. in August have been recorded.

In July, particularly, the weather was such that instruction had to be discontinued and only the most expert of the " A " licence pilots were allowed to take the air. Slightly improved conditions were experienced during August, and it is pleasing to record the following new soloists : Messrs. Harvey (the club engineer), Smith, and Lee. Mr. Learmount, who has been largely responsible for the formation of the Selangor Flg. Club, passed all tests for renewal of his licence.

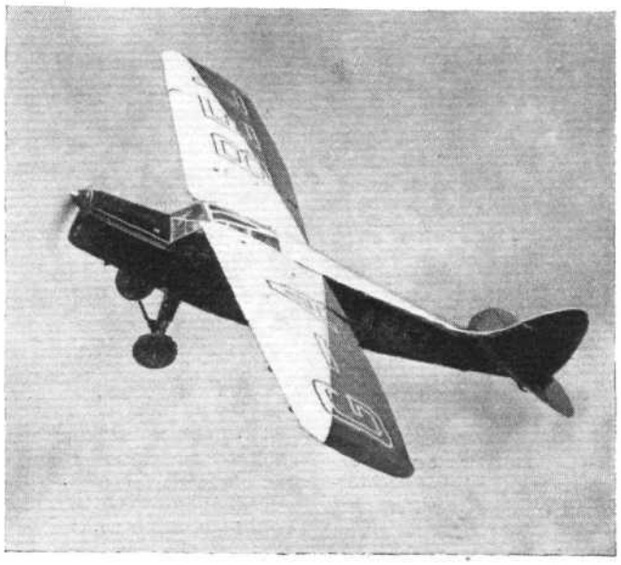


Lady Drummond-Hay, who is an active journalist, is here seen in her " Puss Moth " which has been specially fitted up to enable her to carry on her work in the air. Refinements include :—Handley Page slots, Brown turn indicator, Sperry artificial horizon, special seats, and a folding table opening across the passenger seat which can be used to hold a portable typewriter. (FLIGHT *Photo.*)

Better weather prevailed on the last day of the month, and club members took advantage of the fact. On the 31st, machines were worked all out and record times were set up: G-EBUJ, 7 hr. 40 min.; G-EBUK, 7 hr. 30 min. It is hoped this improvement will be maintained during September.

In keeping with the club's policy, several instructive and interesting lectures were given by the club instructor during July and August. Though these have been well attended, all active club members should make a point of being present, since many hours' air instruction can be saved thereby.

A football match was played against the Singapore Harbour Board on July 30. The Board proved too good for the club by three goals to nil. Harvey, one of the hardest worked men on the field, played an excellent game in goal, and considerable barracking assistance was rendered by the club jagas, who turned out in full force dressed in their Sunday best.



A flying view of Lady Drummond-Hay's Puss Moth (Gipsy III). (FLIGHT *Photo.*)

The club's work is still hampered by lack of machines. The fleet at the present moment consists of three Moths, two of which are in flying trim, while the third is dismantled awaiting the arrival of spares that have been overlong in coming.

Pupils are waiting to fly, instructors are available, but, with only two machines and with poor weather, the results are not as satisfactory as we would like.

The club ground staff are engaged at the moment in experimenting with different kinds of exhaust systems, with a view to reducing the noise of the machines.

The difficulty of their task will be appreciated when it is realised such questions as loss of power, overheating of the air-cooled engine, heat and gases in the cockpits of the machine, weight, method of attachment, have to be considered when attempting to make the engine run more quietly.

The total flying time of the club this year is 747 hr. 25 min., and the grand total since its formation 1,672 hr. 10 min.

THE READING CLUB DANCE.—A very successful dance was held by the Reading Aero Club (which has been formed from the pupils of the Phillips and Powis School of Flying) at the Cadena Café, Reading, on October 15. About 120 guests were present, among them Mr. and Mrs. Bentley, Miss Pauline Gower and Anis Bey, son of the late Under-Secretary of State for Egypt.

Some amusing competitions were arranged, amongst them one for discovering the number of mistakes in a so-called aeroplane (type very unknown); there were 56 faults of construction, and the prize was won by Mrs. Stammers, who found 30 of them. Other competitions were of a more jovial and less technical nature, and prizes of free flights were given.

Those present were grateful to Mr. E. E. Stammers and Mr. Bishop for their respective parts in the organisation.

NAVIGATION LECTURES

THE Guild of Air Pilots and Air Navigators of the British Empire announce that the next series of Navigation Classes will commence at Gwydyr House (by kind permission of the Air Ministry) at 6 p.m. on Tuesday, November 4.

The course will include all the subjects required for the Second-class Navigator's License Examination, which will be held in March, 1931.

The lectures will be given by Capt. Entwistle and Mr. C. B. Collins on Tuesdays and Fridays throughout the winter from 6-7.30 p.m.

The fee for the course will be 5 guineas and equipment will be loaned by the Air Ministry, but a fee will be required for deposit on any tables, charts, or other equipment taken away from the class.

As only a limited number of applicants can be taken will anyone interested forward application direct to Capt. A. G. Lamplugh, together with a cheque crossed "Navigation Account," c/o British Aviation Insurance Group, Ltd., 3-4, Lime Street, London, E.C.3.

SYNOPSIS OF LECTURES.—In addition to the lectures outlined below, practice will be given throughout the course in visual signalling, semaphore and morse.

PROBABLE DATE.	SUBJECT.
Nov. 4 } „ 7 }	Logarithms. Principle of logarithmic calculations. Construction of tables. Calculations by means of logarithms.
„ 11	The Slide Rule. Principle and use. Simple calculations by slide rule.
„ 14	Plane Trigonometry. Elements of. The Trigonometrical ratios. Constructions of tables of the Trigonometrical ratios. The, Traverse Tables. Construction and use of.
„ 18	Meteorology.
„ 21 } „ 25 }	Time. Change of time with longitude. Zone time. G.M.T., L.M.T., L.S.T. Sunrise and sunset, moonrise and moonset. Use of nautical almanac.
„ 28	Form of the Earth. Definitions.
Dec. 2	Middle latitude sailing. Calculation of courses and distances.
„ 5	Meteorology.
Dec. 9 } „ 12 }	Map projections. Elementary principles of construction of the Mercator, Gnomonic and the various Conic projections. Properties of the various projections in common use. Precautions required.
„ 16 } Jan. 6 }	Units of distances and angles. Conventional signs and abbreviations. Methods of indicating height. Map scales Technical topographical terms. Map reading. Sexagesimal and centesimal systems.
„ 9	Meteorology.
„ 13	Mercatorial sailing. Calculation of courses and distances.
„ 16	General revision.
„ 20 } „ 23 }	Elementary magnetism. Earth's magnetism Isogonic and Isoclinal lines, Variation Dip, Horizontal and Vertical components of the Earth's Total Force. Definitions.
„ 27	Meteorology.
„ 30	The Magnetic Compass in aircraft. Common types in use Principles of construction. Desirable features. Care and maintenance.
Feb. 3 } „ 6 }	Deviation. Causes, effects and compensation. Methods of determining deviation with compass base, landing compass, and in the air. Use of amplitude and azimuth tables. Analysis of deviation. The approximate co-efficients A, B, C, D, and E. Northerly Turning Error. Acceleration and deceleration errors.
„ 10	Practical work with a model aircraft.
„ 13	Meteorology.
„ 17	Dead Reckoning. Course, track, track angle, drift, drift angle, measurement of air speed and ground speed. Definitions. Triangle of velocities. Solution of triangles for the determination of drift, course, ground speed, wind speed and direction.
„ 20	Navigation Instruments. Drift Indicator, Course and Distance Calculator, Air Speed Indicator, Altimeter, Turn Indicator.
„ 24	Practical problems, chart work. General revision.
„ 27	Meteorology.
Mar. 3	Direction Finding W/T Systems. The Bellini-Tozi ground system, Rotating Beacon. Equi-signal beacon, Wing coils. Comparative merits.
„ 6	Night effect. Coastal refraction. Quadrantal error. Use of W/T bearings in navigation. Convergency of meridians, conversion angle. Practical problems involving laying off bearings on different projections.
„ 10	Meteorology.
„ 13 } „ 17 }	Air Legislation. The Convention, Air Navigation Act, Accident Regulations, Orders and Directions. Books of reference, *e.g.* Air Pilot, Admiralty Sailing Directions. Tide Tables, &c. Air and marine lights, rules of the air, rules at sea, signals.
„ 20	General revision.
„ 24	Meteorology. General revision.
„ 27	Final revision.

FAIREY AIRCRAFT FOR GREECE

AN order has just been placed with the Fairey Aviation Co. by the Greek Government for a batch of Fairey "III F" aircraft (Napier "Lion" engines). These machines will be fitted with float undercarriages and employed as seaplanes by the Greek Air Force.

This order is the result of a series of demonstrations carried out with a Fairey "III F" in Greece last summer, and we think the following notes regarding these demonstrations may be of interest. The "III F," piloted by Mr. McMullin and with Mr. C. B. Baker as engineer, left England for Greece on July 30, and arrived at Brussels the same day. Here a stop was made to allow the Belgian Authorities an opportunity to inspect the "III F," which they did with considerable interest—all the principal general officers commanding the Belgian Air Force being present.

Next day the journey was continued to Vienna, via Frankfurt, and from here they flew to Belgrade (in 3 hr. 10 min.) on August 1, where, once again, the machine was demonstrated to the authorities—in this case of Jugo Slavia. After this a flight of just over three hours brought them to Salonika, whence, after refuelling, they flew direct to Tatoi Aerodrome, Athens, in 2 hr. 15 min. Here there were several reconnaissance and single-seater military aircraft of different nationalities on the same mission—so the "III F" was likely to be up against some hot competition.

The first few days at Tatoi were devoted to a detailed inspection of the machines by the Greek Military Commission, and the construction of the "III F" was openly admired on all sides. After this, flying demonstrations were carried out, which embraced a climb, speed run, etc., at various altitudes, and a number of general demonstration flights carrying Greek officers. The demonstrations were concluded on August 17 with complete success.

The next stage of the demonstration, viz., to transfer to float chassis and give seaplane demonstration, presented a very serious difficulty. The aerodrome at Tatoi lies about 25 miles from Phaleron, the Naval Seaplane Station on the other side of the City of Athens, and over rather difficult and in some places rough roads. A suitable field where they could land safely near Phaleron, could not be found and, not feeling inclined to chance an accident, the wings and tail plane of the "III F" were removed, and with the aid of an excellent crew of Greek sailors, the machine was towed behind a lorry to the base. It was rather a hair-raising trip, as the road wound round some very steep corners, with sheer drops in many places, and overhanging trees threatening damage to the top centre section.

Phaleron was reached, however, after a long and trying day, and, the floats having been fitted, the next few days were spent in demonstrating to the Greek Naval Department and carrying officers and officials for demonstration flights. After a few more trips as a seaplane, the problem arose of getting back to Tatoi as a landplane. In order to avoid another long tow, a piece of ground was located just behind an aircraft factory near the base, and from here they took off without difficulty. The Greek pilots were impressed with this take-off, for at first they doubted if the "III F" could get away from so small an area. Thus, while it took about twelve heart-breaking hours to get from Tatoi to Phaleron, to get back took only ten minutes!

The demonstrations over, Mr. McMullin flew back to England, the journey, via Uskub, Belgrade, Vienna, Nuremberg, Cologne and Croydon, being accomplished in 14 hr. 35 min.

"Throughout the trip," said Mr. McMullin, "we had not the slightest trouble with either the aircraft or the Napier 'Lion XI' engine, and although it entailed a lot of hard work, Baker and myself enjoyed ourselves heartily."

In the top picture is the Fairey "III F" at Phaleron Bay; In the centre, Mr. McMullin (pilot) has a heart-to-heart talk with the Greek General. In the last two photos we see the "III F" as a land plane, being transported from Tatoi to Phaleron.

GLIDING

GLIDING IN NORTH WALES.—A number of aeronautical enthusiasts have started a gliding club in Wrexham.

In the neighbourhood of Ffrith, a few miles from Wrexham, Mr. Hunter has made a landing ground for aeroplanes, and he has been asked to become the club's first president.

As the pioneers of the Wrexham movement include ex-members of the Royal Air Force, with flying experience in the war, it is hoped to construct a glider at Wrexham, besides arranging a series of lectures on aerodynamics and kindred subjects.

Valuable help in this connection will be given by Mr. Jonathan Jones, science master at Wrexham County Schools, who has done much to stimulate interest in gliding among the students there.

The hon. secretary of the club is Mr. Norman R. M. Whitehall, at Waring's Service Garage, Bradley Road, Wrexham.

THE KILMARNOCK GLIDING CLUB took delivery of their first machine, a Dickson type glider, on Friday, October 17. It was then taken to their flying ground, assembled and rigged, then launched into the air, piloted by a member who is a qualified pilot of the Scottish flying club. The club claims to be the first gliding club and to have the honour of owning the first glider to take the air, in Scotland. A large number of new members have been enrolled since the machine arrived.

Many more successful flights were made on the following Wednesday, and all the members present got instruction.

The club is now affiliated to B.G.A. and hopes, under their guidance, to have a successful career.

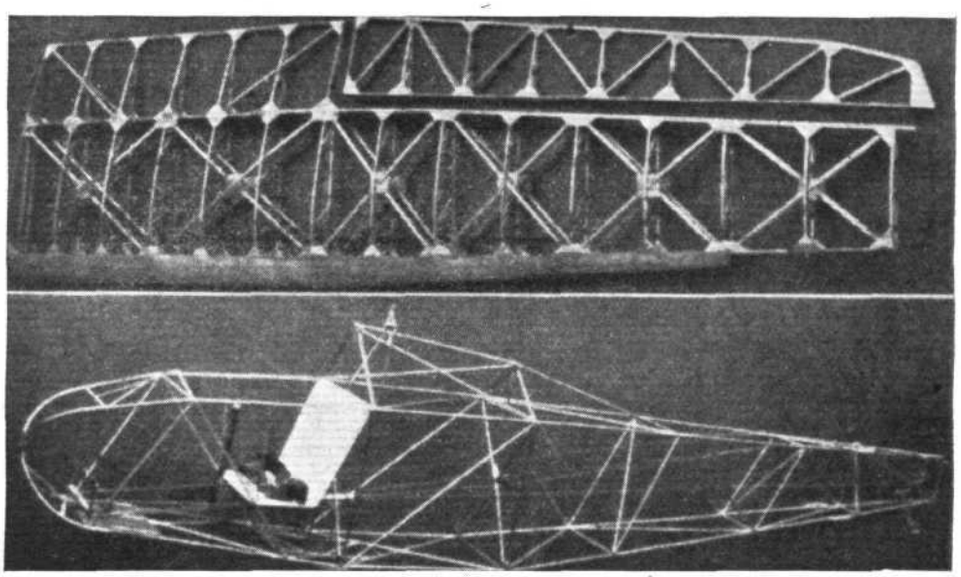
A GLIDER on exhibition!—A modern training "glider," as used by the majority of Gliding Clubs in this country, has been placed on temporary exhibition in the Science Museum, South Kensington.

This machine, which has made over 900 gliding flights, is of particular interest when compared with the historic gliders of more than thirty years ago.

FALKIRK GLIDING CLUB.—Enthusiastic support has been given to the newly-formed Falkirk Gliding Club. Forty-six persons, including two ladies, have intimated a desire to enrol, and it is hoped to commence operations immediately.

BAKER-McMILLEN TRAINING Glider.—The wood-working firm, Baker-McMillen Co., of Akron, Ohio, are certain that the three-stage system of training, so firmly rooted in Germany, will not be adopted generally in America. They reasoned that the only real excuse for a primary type's existence was its low initial cost and maintenance, and it was concluded that an all-purpose glider could be produced which would be suitable for training the student right through into the soaring stages of his training without change. When finally additional refinement was desired, a simple change to special large span wings could be made and the student would be able to cover his entire course by the use of a single machine of moderate price, with perhaps the added cost of a pair of soaring wings in the extreme case.

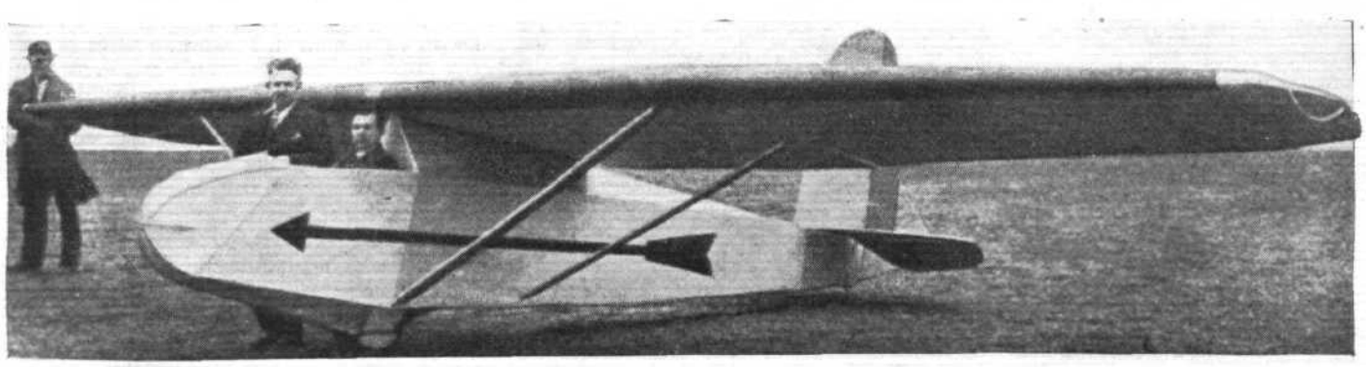
Such a large order all in one machine was a new experience for Frank Gross, designer, but the "Cadet II" now stands as evidence of how well he has met requirements. It is not a primary. It is not a secondary. Neither is it a soarer, but it is all these at once, an all-purpose training glider.



Wing and fuselage construction of the Baker-McMillen training glider "Cadet II," showing the welded steel tube construction of the latter. The wings being wood and fabric

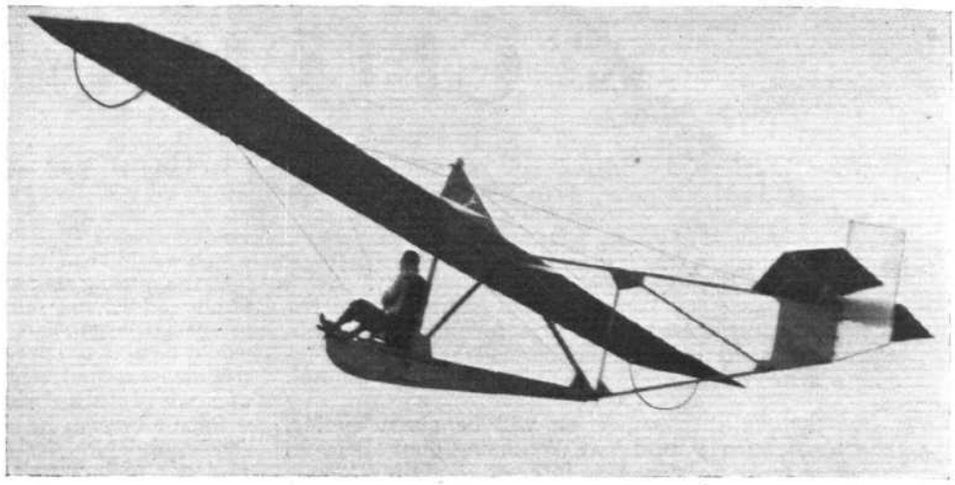
Brief specification of the "Cadet II":—

Span	37 ft. 6 in.
Length	18 ft. 9 in.
Height	4 ft. 6 in.
Weight empty	237 lb.
Weight loaded	407 lb.
Wing area (including ailerons)	162 sq. ft.
Wing loading	2·51 lb. per sq. ft.
Tailplane area	9 sq. ft.
Elevator area	8 sq. ft.
Fin area	5 sq. ft.
Rudder area	9 sq. ft.
Sinking speed	3¼ ft. per sec.
Gliding angle (actual)	1 in 15



The "Cadet II," which combines the designer's ideas of machine to cover training and advanced soaring in one machine.

RUGBY DISTRICT GLIDING CLUB.—Members of this recently-formed gliding club commenced their training at Mr. Lee's farm, Cote Hill, Husband's Bosworth, on October 11, and good sport and nice glides were enjoyed. Resuming the training on the following morning, the glider met with a slight mishap, which prevented gliding for the remainder of the day. The machine was caught in a sudden gust of wind which turned it over on its back, but the damage was not very extensive.



"Miss Durban," the first local-built glider at Durban, S.A.

NORTH KENT GLIDING CLUB.—As notified last week, this club is holding its opening meeting at Joyce Green Aerodrome, Dartford, on Saturday, November 1, at noon. The committee will be particularly glad to see any private owners, or others, who arrive by air, and they would like it known that no landing fees will be charged.

STOCKPORT GLIDING CLUB.—A small but enthusiastic meeting was held at Crossleys Café on Tuesday, October 21, with a view to the formation of a gliding club in Stockport. The proposition was put forward and accepted, that it be named The Stockport Gliding Club, with a subscription of £2 2s for flying members, and that members joining before December 31 be enrolled as founder members; all who join after this date to pay an entrance fee of 10s. 6d.

It was proposed that Mr. J. T. L. Mallard, of The Radio House, Sandy Lane, be temporary Hon. Sec.

Another proposition was that there be an associate membership of 10*s.* 6*d.* for those people who would like to take an interest in the club but did not wish to fly.

Another member made the suggestion that a room be got in Stockport to use as a clubroom and workroom for the repair and construction of gliders.

Yet another suggestion was that they should buy one commercial training glider and construct another training type themselves. In this way experience would be gained for repair work on minor crashes, and so keep the maintenance bill as low as possible.

Many more interesting suggestions were put forward, but it was generally agreed that there must be many absent, who, owing to the short notice and consequent lack of publicity, would have liked to have attended. It was therefore resolved that another meeting be called for Tuesday next, October 28, at Crossleys Café, to commence at 8 p.m. It would then be possible to further discuss finance, rules, the appointment of officials, and suggestions *re* the clubroom.

THE SAIL-PLANE CLUB.—Some useful practice was put in on Sunday, October 26, on the club's training machine, when Mr. C. Compton-Paterson made a clean straight flight of 44 seconds and a perfect landing. As this flight was officially observed, Mr. Compton-Paterson thus qualifies for his "A" certificate.

The club proposes to hold a general meeting (open to members of the general public who are interested) on Sunday, November 9, commencing 11.30 a.m., at "Ye Olde Castle Hotel," Bramber, Sussex, where lunches may be obtained.

It is proposed after the meeting to pay a visit to the club's grounds at Smalldole, one and a half miles distant, where gliding will take place, weather and time permitting.

The construction of the club's new hangar on the gliding site is to commence the week following the general meeting. Will members and non-members who intend to attend the meeting please notify the Hon. Secretary, and say whether they intend to travel in cars or require a seat in an all-weather motor coach which it is proposed to run from London. Address, Hon. Sec., E. G. Smettem, 2, Wine Office Court, Fleet Street, E.C.4.

CONONLEY AND DISTRICT AERO CLUB.—A meeting was held on Sunday, October 26, which proved a great success.

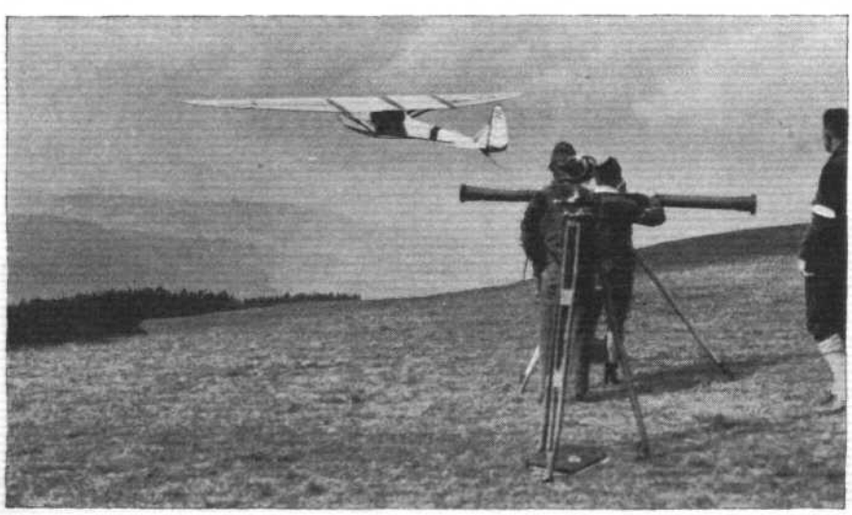
Profiting by previous mistakes, the club pursued a "Ca Canny" policy, and beginners were treated to a little practical "sliding" at first. About twenty members were pushed off, and all made successful slides, followed by glides.

The club's "Dickson" (Cloudcraft) was rigged with a slight dihedral, and proved much more stable, a fact which may be of interest to other clubs.

Four lady members received their elementary training, and showed a remarkably good grasp of the principles.

It is hoped to support the Accrington Club in their effort, and plans are being made to attend the Scarborough Clubs' meeting on Boxing Day.

A dance has been arranged for November 7, and enquiries should be addressed to the Secretary, The Poplars, Utley, Keighley.



An advanced soaring machine starting from the western slopes of the Wasserkuppe.

PRESTON CLUB DEVELOPMENTS.—Sir James Openshaw, D.L., chairman of the Preston Quarter Sessions, has accepted an invitation to become the first president of the newly-formed Preston and District Glider Club.

The club has already placed an order for a training-type glider, and this will shortly be on exhibition in Preston. After showing the machine in a suitable place, a public meeting is to be held at which members will be enrolled.

The secretary of the newly-formed club is Flt.-Lt. L. E. Falla, "Lendor," Lawrence Road, Penwortham Hill, Preston.

DUMFRIES CLUB.—The Dumfries Gliding Club have just obtained a glider, which has been on order for some time from the British Aircraft Co. at Maidstone, and will start gliding shortly at suitable ground near Tinwald Downs. The club has a membership of about 50, under the chairmanship of Mr. H. V. Cox. There are no lady members, but a ladies' section may be formed.

BRADFORD GLIDING CLUB.—The Club held two successful meetings, on October 25 and 26, and altogether over 70 flights were made. The ground at Apperley Bridge was used again as negotiations for the site on Baildon Moor have not yet been completed.

Members of the Club had a very pleasant experience on Sunday, when Mr. Gordon England and Mr. Wapplington paid a surprise visit to the flying ground. They both expressed their approval with the glider and also the method of training in operation.

Members of the Committee took them to view the site on the moor and Mr. Gordon England stated that it was one of the finest sites he had seen, the site being suitable for both training and soaring and being easily accessible from the City.

The constructional section has been started, and on Monday evening members constructed the rib jig for the spare pair of wings for the Club glider (Dickson type) which they intend building.

The next flying meetings will be held on Saturday, November 1, commencing at 2 p.m., and Sunday, November 2, commencing at 9 a.m., at Apperley Bridge. Those interested in the Club should apply to the Hon. Sec., Mr. S. Young, 17, Roslyn Place, Great Horton, Bradford.

"HELL'S ANGELS"

"HELL'S ANGELS," now being presented at the London Pavilion, is a film which no one who has any interest in the air should miss. Its photography is marvellous and certainly by far the best which has ever been seen on the screen in connection with aircraft.

But—and a very large but—there is no doubt that Mr. Howard Hughes, its producer, will not gain the wholehearted support of ex-R.F.C. officers and men. It seems little short of incredible that one who has spent such colossal sums—the film is reputed to have cost $4,000,000 to produce—on obtaining real war-time aircraft and the services of a staff of flying experts and pilots, the size of which make the staff of an aerial transport company look small, should almost entirely neglect the accuracy of every detail of the film except the flying side. Though even here it was asking much to expect us to stomach tight formation flying at night in search of Zeppelins.

On Tuesday night, one could hear snorts of derision all around from those who looked upon the farcical representation of R.F.C. officers, their uniform, their behaviour and, in fact, everything they said and did except flying; as a direct insult to the Service. But, and again a large "but," the misrepresentation of the facts did not stop at the depiction of the R.F.C., it extended into all the personal scenes not actually connected with flying. Why Mr. Hughes did not engage an English actress instead of a blatantly "Amuurican" one is ununderstandable. Why, when spending so lavishly on the production, he did not enlist the services of one of those Englishmen, whom we are told are numerous in Hollywood since the advent of the Talkies, to anglicise the internal decoration of the houses, the furniture, the doors of the rooms, the labels on the shop windows, the postal service and their method of delivering letters and, in fact, the whole non-flying side of the film, is quite beyond comprehension. Why try and make it English at all if it is not going to be done properly? No doubt as it stands it will pass for English in America, but we are told that its consumption over here is even more important.

The story itself is, of course, weak, and the general behaviour of those who are entrusted with catering for that section of the public who cannot do without their "Love Interest," very sloppy, but, unlike other flying films we have recently had thrust upon us from America, "Hell's Angels" triumphs over these faults—seemingly totally unnecessary faults—by virtue of its incredibly magnificent photography. The finest of the scenes are naturally centred round the Zeppelin—a real one, which we are told was built at a cost of $500,000 by the Goodyear Zeppelin Corp. In describing the arrival of this airship through a cloud one would be in the greatest danger of detracting from its majestic beauty if one were to say more than that it is the greatest masterpiece of photography ever seen on the screen. The subsequent aerial combats—using S.E.5's, Camels, Avro's, Snipes, Fokker D.VII's and a Gotha—and the final destruction of the Zeppelin, are marvellous, especially this latter, though one cannot help but regret that its presentation should have come so close on the heels of the disaster to R.101. We imagine that this fact will reflect very greatly on the film's popularity.

Taken all round, "Hell's Angels" is a most magnificent film, which comes within an ace of being ruined—for this country at any rate—through lack of attention to details which should have been correctly presented. It appears that Mr. Hughes has been so bitten with the idea that he was going to produce an unsurpassable flying film that he considered the rest of the story unimportant, with the result that there is a far too well defined line between the excellence of the one and the inferiority of the other.

From the point of view of the cost of production, a few details are interesting.

The staff of pilots was some 137 and the two chief actors had to learn to fly for the purposes of the film.

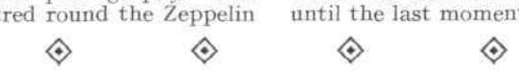
Not one of the aerial scenes is faked and all the crashes shown are real. Reports vary as to the number of pilots who were killed during the production, but it would appear to be between three and seven.

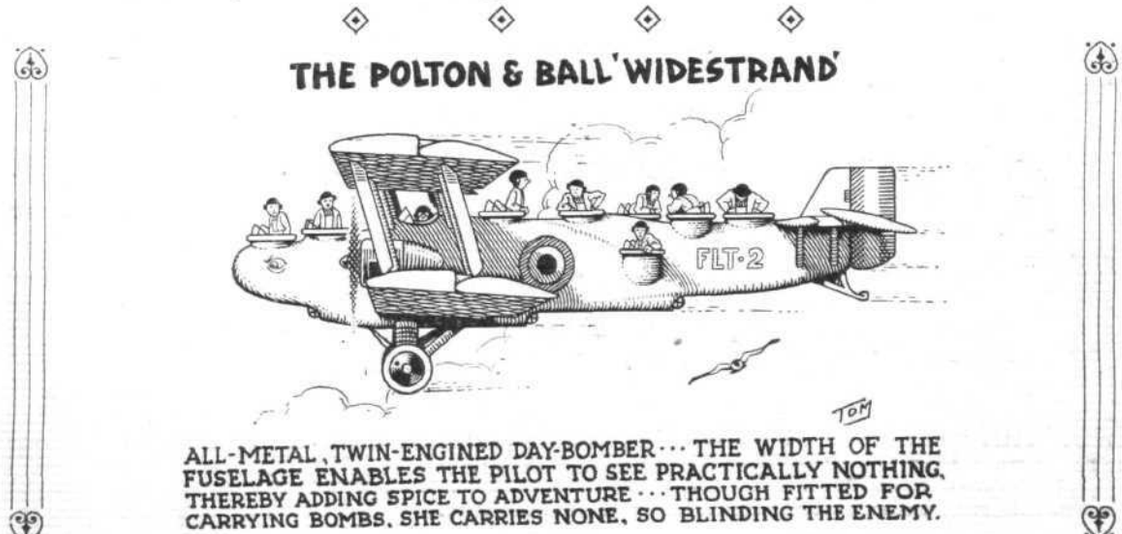
The film has taken since 1926 to produce, though the actual filming did not start until October, 1927. A complete aerodrome was maintained in California as the main base, and a second representing the one from which Baron von Richthofen operated during the war.,

One of the Fokker D.VII's used is reputed to be one of the actual machines used in Richthofen's "Circus," and during the production of "Hell's Angels" it flew over 400 hours.

One other point worthy of mention is the sound and dialogue. This is the best we have heard and in most cases the aeroplane engine noises come through quite realistically instead of being a blurred jumble of harsh sounds.

In view of the size of the production it did seem as if the film was somewhat short, especially as we have been told by people who actually took part all about the mass of material which has been cut out, but as it is the interest is sustained until the last moment.





AIRISMS FROM THE FOUR WINDS

Kingsford-Smith "Home"

FOURTEEN days after leaving England, Wing-Com. Kingsford-Smith arrived "home" at Sydney. As briefly recorded last week, after arriving at Port Darwin, Kingsford-Smith set out in the *Southern Cross Junior*, on October 20, for his flight across Australia to Sydney, where his remarkable dash across the world concluded. The first stage of this trans-Australia flight finished at Cloncurry, and owing to strong headwinds took 12½ hr. for the 907 miles. Next day he completed the 1,000 miles to Brisbane—this time taking 10 hr. for the trip. He received a grand welcome here—his native city—and was given a civic reception at the Town Hall, where speeches were made by the Lord Mayor, the Governor of Queensland (Sir John Goodwin), and the Premier (Mr. Moore). Next day, October 22, Kingsford-Smith flew to Sydney, where he arrived escorted by 18 aircraft. Enormous crowds gathered on Mascot Aerodrome and nearby and gave him an enthusiastic welcome. Of course, one of the first to greet the airman was Miss Mary Powell, his fiancée, and after the domestic greetings were over he was officially received by the Mayor, who presented him with a boomerang, saying it was "symbolical of the man who always gets there and always gets back." Subsequently, Kingsford-Smith went to his parents' suburban home for the remainder of the day. He has stated that this was the last long-distance flight he would attempt.

Aids in the Australian Flight

IT is generally of interest to some to know something of the equipment, accessories, etc., employed in any big flight, such as Kingsford Smith's ten-day-hop to Australia. In this case it is perhaps superfluous to mention that his machine, *Southern Cross Junior*, was an Avro "Avian Sports," fitted with a D.H. "Gipsy II" engine—this being more or less common knowledge—but some of the "items" which aided and abetted are not perhaps, mentioned in general reports of the flight. Here, therefore, are some: in the "Gipsy" engine, B.T.-H. magnetos and a Claudel Hobson carburettor were fitted and Vacuum oil used as the lubricant. "Exide" batteries supplied the currents other than those of the wind variety, while "Palmer's" looked after "Junior" when taking off and landing.

Mrs. Keith Miller

MRS. KEITH MILLER, who flew from New York to Los Angeles on October 17, in 25 hr. 44 min., made the return journey on October 26 in 21 hr. 47 min., thus beating Miss Laura Ingall's record of 24 hr. 35 min. set up on October 18.

Costes and Bellonte Home

CAPT. COSTES and Lt. Bellonte, who accomplished a flight from Paris to New York in the Breguet *Question Mark* on September 1-2, arrived back in France on October 24, when the liner *France* reached Havre early in the morning. A crown of well-wishers welcomed them and later they attended an official reception given by the town of Havre. The next day they flew in the *Question Mark* to Le Bourget and were accorded an enthusiastic welcome. We hope to describe the scenes at Le Bourget in our next issue.

Mrs. Victor Bruce

MRS. VICTOR BRUCE, who left Heston for Tokio in a Blackburn "Bluebird" on September 25, and made a forced landing near Jask, reached Jodhpur from Karachi, *en route* for Calcutta, on October 27.

Capt. Matthews

BAD luck to the end has followed Capt. Matthews, who left Croydon for Australia on September 16. After arriving at Port Darwin on October 18, he proceeded to Sydney, but while flying from Brisbane on October 27, he again made a forced landing, at Lismore, badly damaging his "Puss Moth." He proceeded to Sydney in a mail 'plane.

The Do.X Atlantic Flight

THE start of the Dornier flying-boat Do.X on a Trans-atlantic flight, which was planned for November 3, has been postponed for some days, probably until November 15. Mails for transmission to America by the Do.X will be accepted at Friedrichshafen up to November 8.

A South African Air Service

THE Administration of South West Africa has accepted the tender of Messrs. Junkers, of Johannesburg, for a combined mail, passenger, and freight air service between Windhoek and Kimberley, from April 1, 1931, in return for a yearly subsidy of £7,000 over a period of five years. The Junkers undertake to provide services to all parts of the territory, while the Windhoek-Kimberley service will be flown in conjunction with the arrangements of the Union Government with Imperial Airways for a trans-African service.

New South Wales Air Service Extended

A SHORT while back Queensland Air Navigation, Ltd., extended its Brisbane-Ballina-Lismore air service to Grafton. The service is operated with three-engined Fokker machines.

A Newfoundland Air Mail Service

THE first regular air mail service in Newfoundland has been established by the conclusion of a contract between the Government and Newfoundland Airways. A "Gipsy Moth," carrying 300 lb. of mails, will begin a service between St. John's and the northern settlements in January next.

Greek Air Services

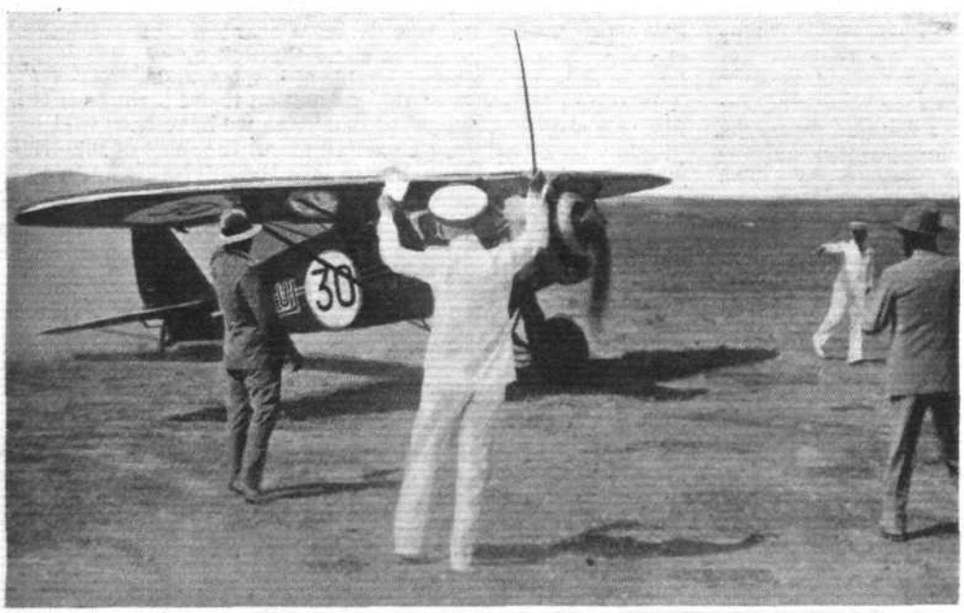
EXCLUSIVE exploitation of air services in Greece has been granted to the aeronautic concern known as "Icaros."

New R.A.F. Caterpillar Member

THE forty-fifth R.A.F. member of the Caterpillar Club is Flying Officer H. L. McCulloch, of No. 30 (Bomber) Squadron, Mosul, Iraq. On September 3 he was flying back to Mosul in formation with another machine, and had just pass Agra, a distance of 53 miles from Mosul, when the other machine was caught in a bad bump and one of its wings and its airscrew struck McCulloch's tail. His machine went down in a spiral to the right, entirely out of control. McCulloch stood up in his cockpit and turned to see what his passenger was doing, but fell out and hit a part of the machine. This spun him several times as he fell, and consequently many seconds elapsed before he found the rip-cord ring. The Irvin parachute opened with no apparent jerk, and he had no difficulty in restricting the oscillation and turning down wind. The pleasure of his gentle descent was marred by the fact that he knew his passenger had not jumped. As F./O. McCulloch weighs over 12 stone and the temperature at that hour (noon) was 110° in the shade, he anticipated a heavy landing, but this did not occur. He suffered no shock.

Airport for Portsmouth

PORTSMOUTH CITY COUNCIL has approved a scheme for a municipal aerodrome, to cost £129,650.



AN ECHO OF THE "CIRCUIT OF ITALY": Our picture shows Col. Sacchi in the Breda 15-S (120-h.p. Walter) landing at Rome during the Circuit of Italy competition, held last August. Col. Sacchi, it will be remembered, was declared the winner of this contest.

AIR TRANSPORT

THE SARO "WINDHOVER"

As briefly reported last week, test flights were recently carried out with a new commercial flying boat constructed by Saunders-Roe, Ltd., of Cowes. We are now able to give some brief particulars and illustrations of this machine, and in a future issue of FLIGHT we hope to describe it in greater detail.

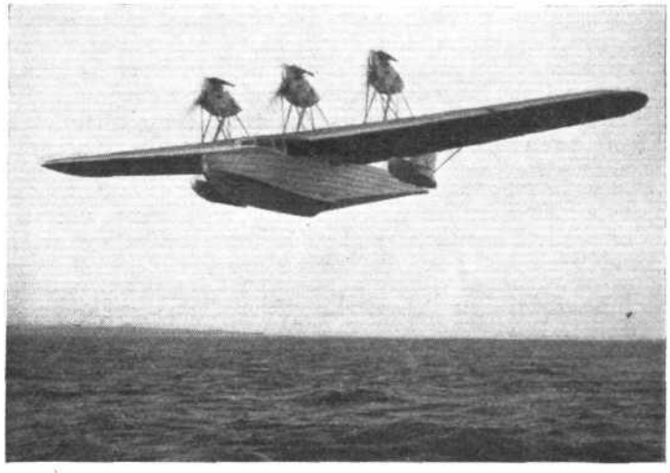
The Saro "Windhover"—the machine in question—is the intermediate member of the Saro Amphibian family, *i.e.*, the "Cutty Sark" and "Cloud," with which our readers are, no doubt, familiar. It is a metal-hull flying boat equipped with three D.H. "Gipsy II" engines, and accommodating six passengers. The "Windhover" was designed to meet the demand for a three-engined machine capable of carrying a good commercial pay load and, the smaller "Cutty Sark" having proved so successful, it was decided to adhere as closely as possible to that design.

The six passengers are located in a comfortable saloon which is spacious, light and airy, with a separate observation window provided for each person.

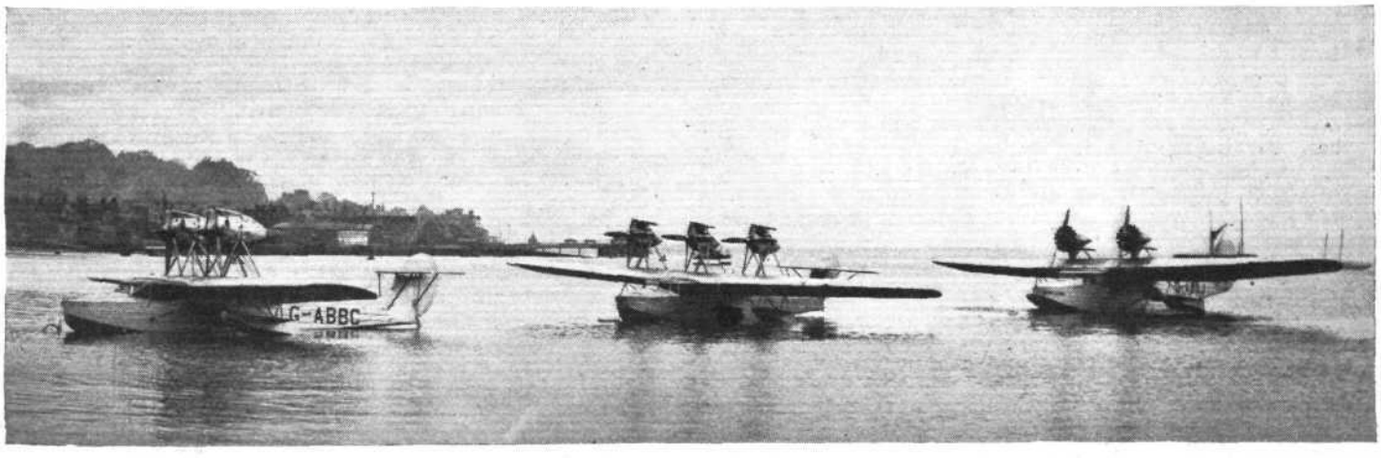
Although the machine is a standardised production structurally, allowances have been made to install any suitable engines, whilst the constructors are always prepared to arrange the interior to suit special requirements, and with this end in view, requests have been made to arrange these types of craft for military and naval purposes.

The machine illustrated—which is being supplied to Dominion Airways, Ltd., for operation in New Zealand—was launched at East Cowes on October 16, and tested on that and the following day. On October 22 it was flown to Felixstowe, the machine being in charge of Capt. Scott, Saro's experimental test and design-development pilot. This craft will fly strongly on any two of the three Gipsy II engines that are installed in the present machine, and directional control during taxying (with two outboard motors running slowly) is remarkably effective.

It may be added, in conclusion, that this machine is provided with terminal fittings, so that a retractable land chassis may be fitted when desired.



The new Saro "Windhover" six-seater flying boat (three "Gipsy II" engines) in flight at Cowes.



THE SARO AMPHIBIAN FAMILY: On the left is the "Cutty Sark," in the centre the latest "Windhover," and on the right the "Cloud."

RECENT DEVELOPMENTS IN U.S. AIR LINES

A NEW air line spans the United States. With elaborate ceremonies, in which officials of the Federal Government, financiers and aeronautical authorities participated, a fleet of nine large tri-motored machines for mail and passengers began operating on October 15, over a 2,102-mile route between Atlanta and Los Angeles via Dallas.

The new service is that of the American Airways (Southern Air Fast Express, Inc. division), a transport line headed by F. G. Coburn, who is also president of the Aviation Corporation. On the opening of the new line, transport 'planes took off simultaneously from Atlanta and Los Angeles, and inaugurated the two-day service with stops at Jackson Miss.; Shreveport, La; Dallas, Fort Worth, Big Spring and El Paso, Tex.; and Douglas, Tucson and Phœnix, Ariz. Dallas is the overnight stop on the line. 'Planes will leave daily from Atlanta and Los Angeles, and eastward and westward from Dallas.

On the machine flying westward from Atlanta were Walter F. Brown, postmaster general; W. Irving Glover, assistant postmaster general; Colonel Clarence Young, assistant secretary of commerce in charge of aviation; Hainer Hinshaw, vice-president of Southern Air Fast Express; F. G. Coburn,

president; and Graham B. Grosvenor, vice-chairman of the board of the Aviation Corporation; Miss Elinor Smith, girl flier and aviation observer for the National Broadcasting Company, and Miss Ruth Nichols, noted aviatrix.

In the delegation out of Los Angeles was Earle Ovington, pioneer aviator who flew the first mail route in the United States from Nassau Boulevard Aviation Field in New York to Mineola, N.Y., on September 23, 1911. At that time, Ovington received his first mail shipment from the then Postmaster-General Frank Hitchcock, and on Oct. 15 last Ovington carried mail from the west cost for delivery to Hitchcock in Phœnix, where the former postmaster-general is now living.

A 12-hour schedule will be maintained between Los Angeles and Dallas, and a 7-hour schedule between Dallas and Atlanta. The Dallas airport will be used as a night lay-over point for both east and west-bound liners.

Southern Air Fast Express operates a fleet of nine Fokker F-10 twelve-passenger monoplanes over the new trans-continental route. The new S.A.F.E. is a subsidiary of American Airways, and was formed to take over the contract let by the Post Office Department to Robertson Aircraft Corporation, a subsidiary of American Airways, and the old Southwest Air Fast Express. American Airways is the operating company for the Aviation Corporation, which is affiliated with the W. A. Harriman Company, New York Banking House.

The Southern Air Fast Express route will increase the daily scheduled mileage of tri-motored 'planes operating on lines controlled by American Airways to 8,902 miles, and that of single-motored ships to 13,998 miles. Through its eastern division, embracing the Colonial air lines, American Airways' machines carry mail between New York and Boston and New York and Montreal. The mid-western division embraces the Universal Airlines, the Embry-Riddle Company and the Interstate Airlines. The latter company holds the air mail contract between Chicago and Atlanta, and will make connections with the new southern trans-continental line. The S.A.F.E. line will be added to the American Airways' southern division, which now consists of the lines formerly operated by Southern Air Transport, Inc.

During August, lines of American Airways carried 5,882 passengers, and from January to August 31 this year, its machines flew 4,719,409 'plane-miles in scheduled service and carried 378·2 tons of mail.

Another development in U.S. commercial air transport is reported from Chicago. Arrangements have been completed between the National Air Transport and the New York Central Railroad whereby an air-rail passenger service will be operated between Chicago and New York in place of that discontinued by the Universal Air Lines.

The National Air Transport, on October 1, inaugurated an air-passenger service between Cleveland and Chicago in conjunction with the New York Central Railroad, which makes possible a 17-hour trip between Chicago and New York, with an equal saving of time to other eastern business centres.

Passengers utilizing the air-rail service from Chicago to New York leave the Chicago Municipal Airport at 3.35 p.m. arriving at Cleveland, 7.30 p.m., where connections are made with the Southwestern, Limited, of the New York Central Lines which reaches New York at 9.30 a.m. and Boston at 11.30 a.m., the following morning. Westbound passengers leave New York at 7.45 p.m. on the Cleveland Limited and Boston at 3.40 p.m., arriving at Cleveland at 8.35 a.m. the following morning. Passengers then board the National Air Transport tri-motored 'plane leaving Cleveland at 9.30 a.m. and arrive at Chicago 11.55 a.m.

Air-rail service is also available from New York to the Southwest, leaving New York on the *Detroiter* at 6.00 p.m., arriving at Detroit at 8.45 a.m. the following morning, connecting with the N.A.T.-Stout Division 'plane, leaving Detroit at 9.05 a.m., and arriving Chicago at 10.55 a.m., where connection is made with the Universal Air Lines, leaving Chicago at 11.00 a.m. for St. Louis, Kansas City, Tulsa, Fort Worth and Dallas.

CROYDON WEEKLY NOTES

AT Croydon we get used to all kinds of novel and queer aircraft. But this week has made us rub our eyes. In the middle of last week we were visited by the two really beautiful Ford monoplanes which have come to Europe for demonstration. In the hands of Mr. Leroy Manning and Mr. H. C. Johnson, they put up a very impressive performance. They appear to be as fast and as manœuvrable as most military fighters, yet are comfortable and efficient passenger carriers. We know that British designers can be better than any in the world. But what British manufacturer has had the pluck to build and market such a machine or British Transport Company to demand it? Behind the skirts of the Air Ministry, which gives them comforting contracts for military machines and regulations to protect their tiny markets, they sit and grow lazy. This is not true of such constructors of small craft as De Havilland, Desoutter and A. V. Roe. But why is it so with the builders of larger machines?

A propos of that and my remarks last week about Air Mails, I hear that the first return flight of the Dutch East Indies service has just taken eight and a-half days from Batavia to Schipol. Vandyk was the pilot, and the machine a Fokker F VII B, with three Titan engines. Since Turkey is still closed to them, Vandyk came by Cairo and Athens. We must congratulate the Dutch for their energy and efficiency.

After the Ford our next strange craft was Personal Flying Services' Sikorsky Amphibian, flown to Paris and back by Capt. "Bill" Styran.

Then came the visit of the Dominion Premiers. For two days the aerodrome was flooded by the Royal Air Force, who brought with them that queer trinity, the Autogyro—"daddy longlegs," the Pterodactyl—"fowl with its tail plucked out," and the Gugnunc—"like nothing on earth." The things these strange birds did were passing belief and gave us nightmares.

In spite of the foul weather, the aerodrome was all agog on Saturday and pleased with the honour of the Imperial Conference visit. It certainly was an eyebrow-raiser to see the numerous kinds of civil and military machines on parade. They indicated the wonderful growth of the aircraft industry recently, especially on the commercial side.

Following the splendid example of our Prime Minister, who flew to and from the Pageant, the delegates kept Imperial Airways very busy in their eagerness to fly, and several somewhat bumpy trips were made over London. The aerobatics display put up by the Royal Air Force was perfect in every detail, and the formation of nine machines strung together was superb. One old ex-pilot declared his delight at having given up regular flying just in time to be spared that kind of thing. And many of the spectators, no doubt, became more air-scared than ever.

Great interest is being taken in the "Comrades of the Royal Air Force" association at Croydon, and the suggestion to call a meeting and set up a committee is to be carried out. The excellent aims of the organisation should attract all those on the aerodrome who are eligible.

The transatlantic Bellanca machine "Columbia" was taken in the Desoutter works last week to be converted to a passenger-carrier. Two days were spent cutting out the big petrol tank in the fuselage. At the end of the third day the cabin and cockpit had been cleaned out, inspected, panelled with brown moquette, and fitted with four comfortable seats for passengers. The "Columbia" has been bought by Personal Flying Service, Ltd., and is to make a propaganda tour with Capt. Boyd and Lieut. O'Connor.

Now that the operating companies have for the most part reverted to single services, the traffic figures have naturally fallen. This week 529 passengers and 47 tons of freight were dealt with. The approach of winter, with its short dark days, shows up the invaluable navigational assistance rendered by the Control Tower staff to machines struggling through bad weather. Lately this department has been very much in the limelight—or should we say "floodlight."

M. L.

Air Mail Conference in Brussels

AT the second Air Mail Conference, which met recently in Brussels, the postal administrations of Belgium, Great Britain, France, Germany, Italy, Switzerland, the Netherlands, Sweden, and Czechoslovakia were represented. The Conference investigated schemes for co-ordinating and extending air mail services, and it was suggested that no additional charge should be made for sending letters by air mail.

THE ROYAL AIR FORCE

London Gazette, October 21, 1930.

General Duties Branch

Lt. J. F. M. Robertson, R.N., is re-attached to R.A.F. as Flying Officer with effect from Oct. 6 and with seniority of April 27, 1925.

The following Pilot Officers on probation are confirmed in rank (Oct. 11) :—C. P. F. Alderson, I. O. Baldwin, J. N. Baxter, B. W. E. R. Bonsey, M. Q. Candler, V. A. Dawson, F. P. R. Dunworth, N. Foster-Packer, H. M. Gahan, F. B. H. Hayward, N. D. Lamb, G. W. Lawson, E. G. Reed, J. F. Sutton, C. H. Williams.

Group Captain R. H. Verney, O.B.E., is placed on half-pay list, scale A (Sept. 18 to Oct. 8 inclusive) (substituted for *Gazette*, Sept. 23) ; Flight-Lieut. C. C. Edwards is placed on half-pay list scale B (Oct. 15, 1930, to Jan. 14, 1931, inclusive).

London Gazette, October 24, 1930.

General Duties Branch

Lieut. H. P. F. Fagan, Somerset Light Infantry, is granted a short service commn. as Flying Officer with effect from Sept. 27, and with seny. of July 15, 1927.

The follg. are granted short service commns. as Pilot Officers on probation with effect from and with seny. of Oct. 10 :—A. A. Adams, D. J. Bateman, J. A. B. Begg, G. R. Canavan, A. L. Christian, W. I. Clarke, A. E. Clouston, J. A. Dobson, J. N. Dufort, J. A. C. Forbes, E. Foster, W. M. Hargreaves, R. H. Harris, W. H. Husbands, N. A. Ireland, L. S. Lamb, L. T. McGinn, J. J. Murphy, L. J. Neale, F. R. Newell, H. L. Pendal, R. A. Phillips, H. Pilling, R. C. J. Rice, D. G. Singleton, F. G. L. Smith (Sec.-Lieut., 5th Bn., Lincs. Regt., T.A.), J. G. Younghusband. The follg. Flying Officers are granted permanent commns. in this rank (Oct. 1) ;—R. J. Legg, L. R. Stokes.

Mate W. G. Boaks, R.N., is granted a temp. commn. as Flying Officer on attachment for duty with the R.A.F. (Oct. 2). The follg. Pilot Officers are promoted to rank of Flying Officer :—R. C. Dawkins, D. R. C. B. de Sarigny, T. W. Hodgson, B. J. Hurren, G. B. Keily, C. R. Lousada, J. S. D. Miles, C. V. Ogden, C. M. Rees, H. A. Shotter (Sept. 15) ; W. N. H. Banks, E. C. Burbin (Oct. 2). Flying Officer J. F. Lawn is transferred to Reserve, Class A (Sept. 26) ; Pilot Officer on probation P. G. Harton resigns his short service commn. (Oct. 10) ; Flying Officer J. H. Harris relinquishes his short service commn. on transfer to Indian Army (Oct. 14). The short service commns. of the follg. Pilot Officers on probation are terminated on cessation of duty :—J. C. L. Bruce (Oct. 10) ; T. N. Fraser (Oct. 15) ; J. A. M. Teacher (Oct. 15).

Flying Officer B. A. C. Danbury is dismissed the Service by sentence of General Court Martial (Oct. 3).

Medical Branch

The follg. Flight Lieuts. are granted permanent commns. in ranks stated (Oct. 15) :—G. M. Anderson, M.B., Ch.B., G. O. Williams, M.R.C.S., L.R.C.P. The short service commn. of Flying Officer N. M. Jerram, M.R.C.S., L.R.C.P., is antedated to April 2, 1928. The follg. Flying Officers are promoted to rank of Flight Lieuts. (Oct. 3) :—N. M. Jerram, M.R.C.S., L.R.C.P., G. O. Williams, M.R.C.S., L.R.C.P.

Dental Branch

Flying Officer B. L. Harrington, B.D.S., is promoted to rank of Flight Lieut. (Aug. 27).

Memorandum

14786 Flight Cadet W. W. Wooldridge is granted an hon. commn. as Sec.-Lieut., with effect from the date of his demobilisation.

RESERVE OF AIR FORCE OFFICERS

General Duties Branch

The follg. Pilot Officers are promoted to rank of Flying Officer :—G. A. G. Bowden (Sept. 18) ; J. G. G. Moore (Sept. 18) ; W. M. Russell (Sept. 21) ; H. C. S. Brand (Sept. 21) ; K. R. Warton (Sept. 21) ; T. F. Owen (Sept. 25) ; J. W. Bradley (Sept. 26) ; P. Johnson (Sept. 26).

The follg. flying officers relinquish their commns. on completion of service:—W. H. Whitlock (June 19) ; A. B. Roche (Aug. 31) ; H. E. Kirk, D.C.M. (Sept. 12) ; H. MacMillan (Sept. 27) ; B. J. Finn (Sept. 29) ; C. W. Carter (Oct. 6). Flight-Lieut. F. R. P. Dexter relinquishes his commn. on completion of service and is permitted to retain his rank (Sept. 16) ; Flying Officer H. W. Nicholl relinquishes his commn. on completion of service (Sept. 12).

Stores Branch

Flying Officer E. W. Husband relinquishes his commn. on completion of service and is permitted to retain his rank (Sept. 12).

AUXILIARY AIR FORCE

General Duties Branch

No. 604 (County of Middlesex) (Bomber) Squadron.—The follg. to be Pilot Officer :—J. Cherry (Aug. 19).

No. 608 (North Riding) (Bomber) Squadron.—The follg. to be pilot Officer :—I. W. H. Thomson (Aug. 29).

Accountant Branch

No. 602 (City of Glasgow) (Bomber) Squadron.—The follg. to be Pilot Officer :—J. O. Buchanan (Oct. 1).

Medical Branch

No. 608 (North Riding) (Bomber) Squadron.—The follg. to be Flying Officer :—J. E. Howell, M.B., Ch.B. (July 9).

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The followng appointments in the Royal Air Force are notified :—

General Duties Branch

Air Commodore W. R. Freeman, D.S.O., M.C., to H.Q., Iraq Command, for duty as Chief Staff Officer, 9.10.30.

Group Captain R. H. Verney, O.B.E., to R.A.F. Depot, Uxbridge, whilst attending Senior Officers' War Course at Royal Naval College, Greenwich ; 13.10.30.

Wing Commander A. R. Arnold, D.S.C., D.F.C., to H.M.S. *Glorious*, pending appointment as Senior Air Force Officer ; 11.10.30.

Squadron Leader P. C. Wood, to R.A.F. Base, Kai-Tak, Hong Kong ; 14.10.30.

Flight Lieutenants : J. MacG. Fairweather, D.F.C., to No. 17 Sqdn., Upavon ; 9.10.30. C. C. Edwards, to Half-pay List ; 15.10.30. F. G. Cator, to H.Q., R.A.F., Middle East ; 7.10.30. H. A. J. Wilson, O.B.E., to Station Headquarters, Mount Batten ; 14.10.30. M. S. Keogh, A.M., to Home Aircraft Depot, Henlow ; 13.10.30. G. S. N. Johnston, to No. 503 Sqdn., Lincoln ; 20.10.30. W. Wynter-Morgan, M.C., to Armament & Gunnery Sch., Eastchurch ; 17.10.30. G. A. Hadley, to No. 445 Flight ; 6.10.30. C. E. N. Guest, to Air Ministry (D.O.I.) ; 20.10.30. R. E. Meek, to No. 22 Group Headquarters, S. Farnborough ; 8.9.30.

Flying Officers : I. G. E. Dale, to R.A.F. Depot, Aboukir ; 22.9.30. L. C. Phillips, to R.A.F. Depot, Uxbridge ; 13.9.30. L. M. Woolveridge, to No. 4 Flying Training School, Abu-Sueir ; 23.9.30. G. F. Hales, to Armament and Gunnery School, Eastchurch ; 8.10.30. J. N. Jaques, to No. 4 Sqdn., S. Farnborough ; 8.10.30. F. C. Tracey, to No. 5 Flying Training School, Sealand, on appointment to a temporary commn. ; 27.9.30. P. F. Luxton, to No. 10 Sqdn., Upper Heyford ; 15.10.30. W. S. C. Adams, to No. 19 Sqdn., Duxford ; 13.10.30. C. E. V. L'E. Feasey, to No. 24 Sqdn., Northolt ; 18.10.30. W. T. Walton, to No. 7 Sqdn., Worthy Down ; 16.10.30 ; E. L. J. Rowe, to No. 13 Sqdn., Netheravon ; 21.10.30. D. Menzies, to No. 4 Flying Training School, Abu Sueir ; 2.10.30.

Pilot Officers : W. G. Eatherley and C. B. Smith, to R.A.F. Depot, Uxbridge ; 28.9.30. L. Crocker, to No. 205 Sqdn., Singapore ; 14.10.30. J. Grierson, to No. 11 Sqdn., India ; 3.10.30. W. F. Pharazyn, to No. 17 Sqdn., Upavon ; 11.10.30. C. P. F. Alderson, and G. W. Lawson, to No. 9 Sqdn., Manston ; 8.10.30. I. O. Baldwin and N. D. Lamb, to No. 10 Sqdn., Upper Heyford ; 8.10.30. F. B. H. Hayward and P. A. Smith, to No. 12 Sqdn., Andover ; 8.10.30. C. E. G. Adye, to No. 17 Sqdn., Upavon ; 8.10.30. B. W. E. R. Bonsey, to No. 19 Sqdn., Duxford ; 8.10.30. F. P. R. Dunworth, to No. 25 Sqdn., Hawkinge ; 8.10.30. N. Foster-Packer, and W. J. Scott, to No. 35 Sqdn., Bircham Newton ; 8.10.30. E. Dawson and C. H. Williams, to No. 43 Sqdn., Tangmere ; 8.10.30. L. E. P. Mahon, to No. 54 Sqdn., Hornchurch ; 8.10.30. M. V. Johnstone, to No. 56 Sqdn., North Weald ; 8.10.30. J. F. Sutton, to No. 99 Sqdn., Upper Heyford ; 8.10.30. D. Carr and E. G. Reed, to No. 101 Sqdn., Andover ; 8.10.30. J. N. Baxter, to No. 111 Sqdn., Hornchurch ; 8.10.30. V. A. Dawson, H. M. Gahan and N. Hill to No. 207 Sqdn., Bircham Newton ; 8.10.30. The undermentioned are all posted to R.A.F. Depot, Uxbridge, on appointment to Short Service Commns., with effect from 10.10.30 :—A. A. Adams, D. J. Bateman, J. A. B. Begg, G. R. Canavan, A. P. Christian, W. I. Clarke, A. E. Clouston, J. A. Dobson, J. N. Dufort, J. A. C. Forbes, E. Foster, W. M. Hargreaves, R. H. Harris, W. H. Husbands, N. A. Ireland, L. S. Lamb, L. T. McGinn, J. J. Murphy, L. J. Neale, F. R. Newell, H. L. Pendal, R. A. Phillips, H. Pilling, R. C. J. Rice, D. G. Singleton, F. G. L. Smith, J. G. Younghusband.

Stores Branch

Squadron Leader T. G. Skeats, to R.A.F. Base, Singapore ; 14.10.30.

Flying Officers : E. H. Walker, to No. 47 Squadron, Khartoum ; 26.9.30, N. W. Law, to Station H.Q., Bircham Newton ; 17.10.30. J. E. R. Sowman, to No. 33 Squadron, Eastchurch ; 28.10.30.

Accountant Branch

Flight Lieutenant F. O. Hall, to School of Naval Co-operation, Lee-on-Solent ; 10.10.30.

Flight Lieutenant H. E. Cardwell, A.F.C., to H.Q., Iraq Command ; 7.10.30.

Flying Officers : R. G. Dyer, to R.A.F., M.T. Depot, Shrewsbury ; 6.10.30. F. W. Judge, to Station Accounts Office, Hinaidi ; 7.10.30.

Pilot Officer J. G. Wigley, to No. 2 Flying Training Sch., Digby ; 6.10.30.

Medical Branch

Group Captain H. W. Scott, to H.Q., Iraq Command, for duty as Principal Med. Officer ; 7.10.30.

Squadron Leader T. J. Thomas, to H.Q., R.A.F., Middle East ; 11.10.30.

Squadron Leaders : E. Barr-Simm, to Central Medical Estabt ; 13.10.30. G. H. H. Maxwell, to Marine Aircraft Experimental Estabt., Felixstowe ; 21.10.30. W. G. L. Wambeek, to Princess Mary's R.A.F. Hospital, Halton, 10.10.30.

Flight Lieutenant L. C. Palmer-Jones, to Princess Mary's R.A.F. Hospital Halton ; 2.11.30.

Flight Lieutenants : J. Hill, to R.A.F. Depot, Uxbridge ; 6.10.30. L. Freeman, to No. 1 Sch. of Tech. Training (Apprentices), Halton ; 4.10.30. J. L. Groom, to Princess Mary's R.A.F. Hospital, Halton ; 4.10.30. L. L. Hyder, to Station H.Q., Bircham Newton ; 18.10.30.

Flying Officers : A. H. Barzilay and J. F. S. Wiseman, to H.Q. Aden Command ; 7.10.30. J. Holt (Quartermaster), to R.A.F. Hospital, Aden ; 7.10.30. J. Murphy, to R.A.F. Depot, Uxbridge ; 27.10.30. M. Pearson, to No. 1 School of Technical Training (Apprentices), Halton ; 1.10.30.

Flying Officer N. M. Jerram, and H. R. Clein, to H.Q., Iraq Command ; 7.10.30.

Dental Branch

Flight Lieutenant J. M. Jamie, to H.Q., Iraq Command ; 7.10.30.

Chaplains Branch

Chaplain The Reverend G. A. Davies, B.A., to H.Q., Iraq Command ; 7.10.30.

NAVAL APPOINTMENTS

The following appointments have been made by the Admiralty :

Lieut.-Commr. (Flight-Lieut. R.A.F.).—E. W. Anstice, reattached to R.A.F., and appointed to *Courageous* (Nov. 4).

Lieuts. (F./O., R.A.F.).—A. P. Colthurst, to *Renown* (Nov. 11). T. H. Villiers, to S/M M 2 (Nov. 3.)

Hours for Gwydyr House Visitors

An Air Ministry Notice to Airmen points out that visits to the Air Ministry (C.A.2), Gwydyr House, Whitehall, in connection with applications for the issue, renewal or endorsement of civil aviation licences, etc., should ordinarily be made between the following hours :—Monday to Friday, 11 a.m. to 4 p.m. ; Saturday, 11 a.m. to 12 noon. Applicants wishing to call at other hours are requested to make an appointment.

MODELS

THE MODEL AIRCRAFT CLUB (T.M.A.C.)

AT the Horticultural Hall on Wednesday, October 22, the first indoor flying meeting of T.M.A.C.'s winter programme was held, and a very good attendance provided excellent sport and thrilling moments.

Duration performance was of a very high order, and Mr. A. T. Willis headed the list with a spar tractor doing 75 sec. in climbing spirals that were a delight to see. Master A. M. Willis treated us to an exhibition of slow rolls and spiral climbs that fascinated the watcher.

The R.O.G. Competition provided the thrills (and beauty) of the evening. To watch the models passing each other without any regard to traffic regulations gave one the feeling of imminent disaster, but automatic stability avoided any crashes, and the models flew away to the accompaniment of sundry " oh's and ah's " from the spectators.

Mr. Dent's low wing fuselage monoplane gave the most perfect exhibition of how to take off (in 14 sec.) that anyone could wish to see, whilst the grace of Mr. Burnett's tractor in flight was only eclipsed by the huge variety of models in the air.

One crash must be put on record. Mr. Willis, in trying to beat his 75-sec. record " landed " in the suspension chain of an arc lamp, and in attempting to remove it one wing was badly damaged.

Mr. Rigby, the *papier mache* expert, was very much in evidence with a fleet of cabin planes, scouts, bombers and fighters, and for sheer speed (hand launched) he is hard to beat; particularly when he throws in a few loops and vertical banks by way of variation.

All London members should make a point of being at the Horticultural Hall on Thursday, November 6, at 7 p.m., when it is hoped that a talkie film will be made of our indoor flying activity, so that provincial members will be able to see exactly what is being done in this direction.—A. E. JONES, Hon. Sec., 48, Narcissus Road, West Hampstead, N.W. 6.

FLIGHT feels it must congratulate this go-ahead club—T.M.A.C.—on introducing this indoor flying—there appear to be great possibilities in it, especially during the winter evenings, and it should add a new outlet for the energies of aeromodellists. Since its formation, not so very long ago, the Model Aircraft Club has made considerable progress in all directions, and just recently a scheme—quite a good one, we think—of re-organisation was launched. We think it may interest readers if we outline the club's aims by quoting a circular letter recently sent out. After pointing out that " it does not favour altogether the construction of so-called 'flying sticks,' which can merely claim lengthy duration of flight, it appreciates the value of this class of model, but most of its members concentrate on producing models of scientific value and construction, conforming closely to full-size machines," it proceeds with the following :—

" The aim of T.M.A.C. is to create, promote and develop airmindedness in every meaning of the word among the present generation, and particularly the youth of the British Empire. Our club is of international character and is the largest active aeromodellists' club in the world. Our organisation, considering the area over which our members reside, must necessarily be such that no one single member is overlooked or fails to keep him or herself in touch with the latest movement in the flylng world. It is a fact that practically all our present-day constructors of aircraft were, in their youth (and many still are) enthusiastic and successful modellists. History has a habit of repeating itself and our future aircraft constructors will be in a large measure the normal development of T.M.A.C. membership. Not all of us wish to enter into full size practice and so the club satisfies both types of members.

" Below are enumerated a few items of our 1930-1 programme which will be of great interest to you as a prospective, active or honorary member.

" The organisation of groups, wings, squadrons and flights (with the necessary ranks and authorities that are part of the scheme). Promotion from flight member to flight leader and so on up to group commander can only be obtained by the member excelling in flying efficiency or other of those attributes which go to build up character and leadership. From time to time lectures (theoretical and practical) will be given by successful modellists and men of moment in the world of flight on such subjects as: Principles of flights. Aircraft construction. (Models and full size). Practical flying.

" Regular flying meetings will be held, together with monthly or quarterly squadron competitions, and inter-wing contests. It is hoped in the not too distant future to take over a permanent headquarters in London with club facilities for members. We are all pulling together for a bright and successful future, and our three guiding stars are: Discipline, leadership and initiative. Are you for or against ? "

Great Yarmouth Air Station Reunion Dinner

THE eleventh annual reunion dinner of those officers who served at Great Yarmouth Air Station between the years 1913 and 1920 was held at the Cafe Royal on October 25.

CONSTRUCTORS' SPECIAL NOTICES

De Havilland Notice to Owners and Operators of Gipsy Engines II and III

Washers in Oil Systems of Gipsy Engines II and III.—A new copper and asbestos type of washer has been evolved for use in the oiling systems of these two engines. Operators of these engines are strongly advised to fit them in place of the existing oval Hallite washers. These washers are for fitment at the flange joints where oil elbows are bolted to the pressure oil filter casing.

By quoting Part No. 1306-32 A., these washers will be supplied, free of charge, on application to the Service Manager, The de Havilland Aircraft Co., Ltd., Stag Lane Aerodrome, Edgware, Middlesex.

(*No. 2, October* 28, 1930.)

De Havilland Notice to Owners and Operators of Puss Moths

D.H. Puss Moth Controls.—Although the controls of the Puss Moth are amply strong to deal with all ordinary loads, it has been found that one component does not possess the requisite strength factors for coping with cases of excessive loading produced by very severe application of the rudder while the aircraft is taxying. The part involved is the rudder cable-rocking lever, Part No. H 30300 A., located just at the rear of the back of the cabin. It is therefore recommended that this lever be changed for one of new design, Part No. H. 30300 A. modified, or H. 33163 A.

The necessary parts and instructions can be obtained, free of charge, on application to the Service Manager of The de Havilland Aircraft Co., Ltd., Stag Lane Aerodrome, Edgware, Middlesex.

It is understood that the Air Ministry is issuing a notice to ground engineers and owners concerning the above.

(*No. 3, October* 28, 1930.)

PUBLICATIONS RECEIVED

Contact. By Elliott White Springs. London : John Hamilton, Ltd. Price 7*s.* 6*d.* net.

Offer of Marriage. By Berta Ruck. London : Cassell and Co., Ltd. Price 7*s.* 6*d.* net.

Henley's A.B.C. of Gliding and Sailflying. Edited by Major Victor W. Page. The Norman W. Henley Publishing Co. New York : Price $2.

The Royal Air Force Quarterly. Vol. I. *No.* 4. *October*, 1930. London and Alderhot : Gale and Polden, Ltd. Price 5*s.* net.

Imperial Air Routes. By Major A. E. W. Salt, M.A. London : John Murray. Price 6*s.* net.

Journal of the Royal Air Force College, Cranwell, Lincolnshire. Vol. X. No. 2. *Autumn*, 1930. London and Aldershot : Gale and Polden, Ltd.

Mitteilungen aus den Forschungsanstalten. Sept., 1930. VDI-Verlag G.m.b. H., Berlin. Price RM. 3.

Powdered and Granulated Aluminium. The British Aluminium Co., Ltd., Adelaide House, King William Street, London, E.C. 4.

Wegerdt, Deutsche Luftfahrtgesetzgebung. Gebr. Radetzki, Berlin. Price M. 9.50.

Year-Book, 1927-8-9-30. The Royal Aero Club of the United Kingdom, 3, Clifford Street, London, W. 1.

Canadian Military Institute ; Selected Papers from the Transactions of the Institute, 1928–29. The Canadian Military Institute, 245, Simcoe Street, Toronto, Canada.

New Wars : New Weapons. By Lt.-Commander the Hon. J. M. Kenworthy, R.N., M.P. London : Elkin Mathews and Marrot, Ltd. Price 3*s.* 6*d.* net.

AERONAUTICAL PATENT SPECIFICATIONS

(*Abbreviations* : Cyl. = cylinder ; i.c. = internal combustion ; m. = motors. The numbers in brackets are those under which the Specification will be printed and abridged, etc:)

APPLIED FOR IN 1929

Published October 30, 1930

16,954. SIR A. V. ROE AND SAUNDERS-ROE, LTD. Turn-button fastenings. (335,957.)

19,903. GRAHAM AMPLION, LTD., D. SINCLAIR, A. D'A. HODGSON and W. J. RICKETS. Wireless systems for use in navigation. (335,967.)

FLIGHT, *The Aircraft Engineer and Airships*

36, GREAT QUEEN STREET, KINGSWAY, W.C.2

Telephone : Holborn, 1884 ; Holborn 3211.

Telegraphic address : Truditur, Westcent, London.

SUBSCRIPTION RATES POST FREE

UNITED KINGDOM			UNITED STATES			OTHER COUNTRIES*		
	s.	*d.*					*s.*	*d.*
3 Months	8	3	3 Months		$2·20	3 Months	8	9
6 ,,	16	6	6 ,,		$4·40	6 ,,	17	6
12 ,,	33	0	12 ,,		$8·75	12 ,,	35	0

* *Foreign subscriptions must be remitted in British currency.*

Cheques and Post Office Orders should be made payable to the Proprietors of " FLIGHT," 36, Great Queen Street, Kingsway, W.C.2, *and crossed Westminster Bank.*

Should any difficulty be experienced in procuring " FLIGHT " *from local newsvendors intending readers can obtain each issue direct from the Publishing Office, by forwarding remittance as above.*